THE AMERICAN GAS LIGHT JOURNAL

REDMANKENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LXII.—No. 3. Whole No. 1,024. | NEW YORK, MONDAY, JANUARY 21, 1895. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

Terms of Subscription, Including Postage—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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MR. SYLVESTER S. TOWNSEND, who for years represented the firm of Messrs. P. H. & F. M. Roots in this section, died on the 14th inst.

[OFFICIAL NOTICE.]

Twenty-fifth Annual Meeting of the New England Association of Gas Engineers.

OFFICE OF THE SECRETARY, January 11, 1895.

The twenty-fifth annual meeting of the New England Association of Gas Engineers will be held at the Parker House, Boston, on Wednesday and Thursday, February 13 and 14, 1895.

C. F. PRICHARD, Secretary.

[OFFICIAL NOTICE.]

Second Annual Meeting, Michigan Gas Association.

OFFICE OF THE SECRETARY, SAGINAW, MICH., Jan. 14, 1895.

The second annual meeting of the Michigan Gas Association will be held at Saginaw, Mich., on Wednesday, February 20th, 1895.

HENRY H. HYDE, Secretary.

BRIEFLY TOLD.

THE ASSOCIATION MEETINGS FOR 1895.—Our current issue contains official announcements from the Secretaries of the New England Association of Gas Engineers and the Michigan Gas Association respecting the times and places at which their respective meetings for 1895 are to be held. Mr. Prichard's notice shows that some changes have been ordered in the instance of the New England meeting, perhaps the most important of which is the necessity of holding the convention in the Parker House instead of at Young's, where the Association's assembly had almost reached the stage of a fixture. The necessity, however, arose not from the desire of the Board of Directors to order a change, but from the fact that Young's was unable to furnish the accommodations usually vouchsafed, through the same having been arranged for by other parties some months ago. The fact remains nevertheless that the Parker House folks are quite up to the task of housing the members of the Association in the very best manner, although it might be well that those intending to be present at the meeting should secure their quarters as far in advance of the time set as possible. Although Mr. Prichard was unable this week to publish a completed programme of the meeting, we have gathered sufficient points to intimate that the New England's members and guests are assured of a convention that will be profitable, harmonious and fraternal. President Nettleton, by-the-way, may have something to say in his inaugural address that will be provocative of much discussion.

The Michigan Gas Association is to convene at Saginaw, Michigan, on the 20th of February, and while we have no inkling as to the advances made in the preliminaries for the meeting, we all know that careful men like President Dean and Secretary Hyde can be relied upon to have everything in order at the appointed time. It is to be hoped that every Gas Company in the State of Michigan will deem it a duty to have representation in the Association; for it is not possible to successfully resist the claim that membership in the body will return many times over the expense involved in securing and maintaining such representation.

TEXAS TO MOVE IN THE LINE OF ASSOCIATING.—Too late for publication in our last number we received the following letter:

AUSTIN GAS LIGHT AND COAL CO.,
AUSTIN, TEXAS, Jan. 5, 1895.

To the Editor AMERICAN GAS LIGHT JOURNAL: We (the men engaged in the lighting business in this State) are talking "organization"—in fact, we are going to organize. Most of the members of the defunct Southwestern Gas Association approve of, and several of the gas men who were not members of the Southwestern also, approve and will assist

in organizing an Association of and for the Texas lighting men. In fact, we are strong enough now to make a pretty good beginning, but we want every lighting man in the State to know about our organization and to join it at the start.

To that end I would like to know what it will cost us per inch or line to reach them through your paper. I think that will be the easiest and quickest way to get at them. Also, where can I get a copy of the constitution and by-laws of the New England, American, Western, Ohio or Michigan Associations—any or all of them? If you will answer at your earliest convenience I will appreciate your kindness.

Very respectfully, W. E. HOLMES.

While Mr. Holmes' letter came to hand too late for proper mention and acknowledgment in our last issue, it is also true that it could have been answered before this through the mails in the ordinary way. Still we deemed it wiser to wait and answer it in the JOURNAL, in the belief that the publicity thus gained would more than offset the slight delay that has taken place. To begin with, the gentlemen who are interested in the proposition to form an Association representing the lighting industry of Texas can count upon the freest possible use of our columns to further their purpose without any charge therefor. Furthermore, anything that we can do on our individual account to advance the cause will be gladly done. Mr. Holmes, who is Superintendent of the Austin Gas Light and Coal Company, can secure the documents inquired for by communicating with the following:

Mr. Chas. F. Prichard, Secretary New England Association of Gas Engineers, Lynn, Mass.; Mr. A. B. Slater, Jr., Secretary American Gas Light Association, Providence, R. I.; Mr. Jas. W. Dunbar, Secretary Western Gas Association, New Albany, Ind.; Mr. A. P. Lathrop, Secretary Ohio Gas Light Association, Columbus, O.; Mr. H. H. Hyde, Secretary Michigan Gas Association, Saginaw, Mich.; Mr. John A. Britton, Secretary Pacific Coast Gas Association, Oakland, Cal.; Col. F. S. Benson, Secretary Society of Gas Lighting, Brooklyn, N. Y.; Mr. A. K. Quinn, Secretary Guild of Gas Managers, Newport, R. I. We have given the names of the Secretaries of all the regularly organized Associations in the States, so that Mr. Holmes may have at command everything pertaining to the subject. We further believe that it will not be necessary for him to do more than acknowledge the receipt from the gentlemen named of the documents thus asked for, since we put this as an invitation to them to aid him in the manner indicated.

NOTES.—"Western Observer," under date of the 14th inst., says: "Mr. Walter L. Brown has disposed of his interest in the Northwestern Gas Company, of Evanston, Ills. Mr. Brown found the work of looking after the estate left by his father, combined with the task of managing the Gas Company, too much for the time at his command. Probably no other gas man in the country has so thoroughly systematized the keeping of consumers' accounts as has Mr. Brown. The readers of the JOURNAL will remember his paper entitled 'New Features in Routine Office Work of Small Gas Companies,'[1] read at the Detroit (1892) meeting of the Western Gas Association. We are sorry to lose him from the active ranks, and in regretting his retirement we still can heartily welcome his successor—Mr. John W. Rodgers, formerly of Racine, Wis., and now of La Crosse (in the same State), where he recently secured control of the last named plant. I wish and predict for him good, round success in his latest venture."——At the annual meeting of the shareholders in the Yonkers (N. Y.) Gas Light Company, held on the 16th inst., the Directors elected were: Robt. P. Getty, Samuel D. Babcock, James Bruce, Warren B. Smith, James Slade, Wm. Warburton Scrugham, John Kendrick Bangs, Alfred Jones and Harold Brown. At the meeting of the Board of Directors Mr. Wm. W. Scrugham was elected President and Treasurer, and Mr. Jas. D. McIntyre was chosen Secretary.——The work of extending the main system of the American Gas Company's Mount Vernon (N.Y.) plant was carried out under contract by Messrs. J. W. Hoffman & Co., of Philadelphia. Superintendent Gerould says that it is the most satisfactory piece of work of the kind that he has overlooked; and Gerould's experience in that line is by no means small.——The annual report of the Board of Gas and Electric Light Commissioners is in the hands of the printers. The apparent net profit for the year of all the Gas Companies in the State is returned at $1,400,513.95. Reductions in the gas rate were made during the year by 20 separate Companies, and the average rate paid by the consumers dealing with Companies whose annual make exceeds 30,000,000 cubic feet is $1.20 per 1,000.——Mr. Morgan Tracey will hereafter act as Superintendent of the Penn Yan (N. Y.) Gas Company, in addition to carrying on the duties of Secretary.——The new plant of the Nyack (N. Y.) Gas Light and Fuel Company has been completed.——Mr. Silas H. Seymour has been appointed receiver of the Salamanca (N. Y.) Electric Light Company, with power to operate the same pending mortgage foreclosure proceedings recently instituted.——The Directors elected at the annual meeting of the New Orleans (La.) Gas Light Company were: A. H. Siewerd, B. M. O'Brien, Jas. Jackson, Alden McLellan, A. Baldwin, F. T. Howard, T. L. Macon.

1. See JOURNAL, June 6, 1892, p. 815.

The Gas Tramway at Dessau.

Herr W. von Oechelhaeuser, in a communication to the London *Journal* on the operation of a street railway in Dessau by means of gas motors, remarks:

The gas tramway at Dessau commenced regular running on the 15th of November. It is 2¾ miles in length, consisting of two sections—one 1.55 miles long, the other 1.20 miles. The track is formed with "Phœnix No. 7" grooved rails, set to a standard gauge of 4 ft. 8½ in., and has many sharp curves—one to a radius of only 40 feet. Besides several easy rises, there is one about 150 yards long, with a gradient of 1 in 30, ending in a sharp curve. The first (longer) section was opened on the above date; the second, on the 6th of December. The provisional rolling stock is 9 gas motor cars on Luhrig's system. Under one seat of the car is a gas engine of 7-horse power, the two cylinders of which lie horizontally opposite one another, the pistons working on a common crank axle. The engines are furnished with valve motion and electric igniting apparatus, and they were provided by the Deutz Gas Motor Works.

The chamber containing the motor is tightly closed beneath, and on the inside, but on the outside there are a large folding door and two small flaps giving access to it. When the doors are shut the position of the engine is indicated only by the semicircular depression in the casing for the accommodation of the flywheel. From the opposite side the car presents the appearance of an ordinary horse or electric car. The spent gases from the engine are expelled beneath, without noise. The gas used (ordinary illuminating gas, compressed) is carried by the car in three stout-walled wrought iron reservoirs, of which the largest is beneath the seat on the opposite side of the car to the engine; the two smaller ones being placed under the body of the car before and behind the wheels. The three holders have a united capacity of 28 cubic feet, and they are filled with gas to a pressure of 6 atmospheres.

Oil gas for lighting has been carried in precisely similar fashion on railway carriages for years, and at quite as high a pressure. The holders act as reservoirs of power on the gas tramcars; on the railway wagons light is supplied from them. The danger of explosion, which many people fear with gas tramcars, is no greater, as they are now constructed, than with gas engines and gas lit railway carriages. There are 26,000 gas engines continually at work in Germany, and the majority of the railway carriages are provided with compressed gas; yet an exploded gas engine or railway carriage is unheard of. The setting on fire of a gas car at Dresden lately was traced to negligence on the part of the attendant, and the employment of an old pattern union on the hose used for filling. The cap of the connection was not in this case (as in the Dessau cars) outside the car, but inside it. Occasional fires such as this have repeatedly occurred on electric lines through the firing of the fastenings of the electro-motor, or the overheating of the resistance box used to regulate the current; but the advantages and utility of the system are not therefore called in question.

The Dessau cars carry about 66 gallons of water for cooling, and they weigh, in running order, about 6 tons, which may be easily reduced in the future. The cars seat 12 persons inside and 15 outside, thus carrying, with the conductor, 28 people. The speed can vary at will within wide limits, but the regulations at Dessau permit a maximum of only 7½ miles per hour. A lever on the platform controls the speed. The reversing gear lever is adjacent, and the brake handle, with a bell indicator, is also near by. The trial trips that preceded the opening of the line showed that the cars were easily managed, and that the brake would pull up a car in 2½ yards when running at the maximum speed. When the car is running the engine works at the rate of 250 revolutions. During short stops it runs free at 80 revolutions, but during long stops it is pulled up, and restarted by turning the flywheel—an office easily performed by the conductor.

At the terminals of each section are two compressing stations, where the gas taken from the street mains is compressed. The stations consist of a small house, covering a space of about 15 feet by 15 feet, containing a gas engine of approximately 8-horse power coupled directly to the gas pump. Under a projecting roof outside the house, are two large boiler shaped receivers for the gas (compressed to 8 atmospheres), as well as the coolers for the gas engine. From each station a service runs to the street tram line, where the compressed gas is drawn off from a standpipe.

The working of the two sections takes place as follows: Three (on Sundays four) cars are used on each section; one starting from each end every 15 minutes. The store of gas suffices for two out-and-home journeys; and then the holders are replenished by connecting up with

a flexible tube to the standpipe. The refilling takes about three minutes, and the cooling water is at the same time changed if required. It is intended in future to run at intervals of 7½ minutes. The fare, collected by a recording apparatus, is 10 pfennigs (2.4 cents) on each section of the line. But at the junction passengers may change from one section to the other without further payment, so that nearly 2½ miles can be traversed for the above fare.

The working results since the opening of the line have reached, and even surpassed, expectations. The performance of the system from a technical standpoint was magnificently proved on the opening days, and repeatedly on Sundays, when, instead of 28 people, 50 to 60 persons crowded on each car. The prescribed speed was easily maintained, and, at times, it even reached 8½ miles per hour. One car could push up the steep rise already mentioned another car, the motor of which was not working, even when both cars were full. It is noteworthy that the first car, filled in Deutz with compressed gas at the Deutz Gas Motor Works, after the five days' transit to Dessau ran the whole length of the line by means of the gas with which it was charged at Deutz—an eloquent testimony to the soundness of the holders and the transportability of the cars.

The economical results are so far very satisfactory. On the first opened section, over 24,000 persons were carried during the latter half of November; and since then the number of passengers has not fallen below 600 per day. The traffic on the more recently opened section has been even greater—not having yet fallen below 1,000 persons per day. During the 25 days from its opening to the 10th of December, more than 40,000 persons were carried. It is clear that the new means of transit has found favor with the inhabitants of Dessau (population 42,500) and neighborhood. The public has already expressed a wish for the extension of the gas tramway, and at a general meeting of the Company on the 19th of December, it was resolved to procure four spare cars for the better accommodation of the Sunday traffic, and to increase the capital to meet the extension. The capital for the original work (2½ miles of line, two compressing stations, nine cars, sheds, repairing shops, and office) amounted to 325,000 marks, about $80,000.

Since the opening many interested persons, here and abroad, have viewed the Dessau gas tramway, and convinced themselves of the great advantages of the new method of working. The German Continental Gas Company likewise have received almost daily inquiries as to the working from town authorities, private people and editors; so that it may be expected that other towns will shortly possess gas tramways. The advantages of gas for street tramways arise almost wholly from the power—*i. e.*, the gas—not being taken up continuously during working, but being stored before beginning work and during the intervals. The cars thus resemble steam and electric accumulator cars. But the latter have not, up to the present time, proved reliable; and steam tram cars, on account of their smoke and costly working, can have only a limited application in towns. Thus gas cars form the only system which can be seriously taken into account for tramways—possessing the advantage that each car is complete in itself, and is during the journey quite independent of the power station and of other cars. The gas-driven cars can run on any line without a conductor for the power being required. The overhead conductors now customary with electric tramways are not needed with gas lines; and consequently the cost of their erection, maintenance and depreciation is saved with the latter. There are disagreeable accompaniments with these conductors—such as the disfigurement of the streets, the interference with traffic, and with the extinction of fires and the disturbing and damaging of the telephone services. In the last two months fires have arisen in Barmen, Bochum, Dortmund and Belgrade through the accidental contact of the telephone wires with the conductors.

Interruptions in the traffic itself, owing to damaged conductors, are also inherent to the electric system.

With gas cars there is economy both in the cost of installation and of working as far as the power station is concerned. An electric line, on which six cars each of 7-horse power are in use, would require at the central station power at least amounting to 60-horse power—meaning, as a rule, the use of steam engines, boilers and a high shaft. Such an installation takes up much space, needs at least two attendants, and must be kept at work as long as the cars are running. On the other hand, the gas compressing stations take up little space, may (if necessary) be below ground, and produce neither smoke, soot nor noise. They require the attention of only one man, and they need not be at work all day. At Dessau, for instance, each compressing station is at work for only three hours per day, and the attendant has time available for other purposes. The 8-horse power engines at these stations could, at full work, maintain 20 cars running uninterruptedly, while the same number with electric power would require a central station with at least 200-horse power available. As the gas cars are independent of the central power station, a temporary breakdown at the station does not interrupt the traffic, as is frequently the case on electric lines. The independence of the gas cars allows the running of one to cease without the others being affected; and the next car can propel one that, for any reason, has failed. With electric cars, on the other hand, all those supplied from one conductor are thrown out of work if an interruption (such as the failure of a connection) occurs on one of them. The further disadvantage of electric lines, which is specially noticeable in America—that gas and water mains are frequently damaged by deflected electric currents—is, of course, absent in gas lines.[1]

Finally, it may be said that the gas tramway, of all systems known at the present time for mechanical traction, takes a pre-eminent place as regards convenience of traffic, cheapness of installation and working, and inertness towards telephone wires and gas and water services. It affords an output for gas, large and regular throughout the year, surpassed by no technical demands. In Dessau the consumption during the first year is expected to amount to 5,300,000 cubic feet; and probably it is in general greater in summer than in winter. The gas tramway promises to afford to the gas industry considerable support, and with it and the Welsbach light in our minds, we can enter on the new year with great hopefulness.

Hydrogen Peroxide.

Nature asserts that hydrogen peroxide has at last been isolated by Dr. Wolffenstein in the laboratory of the Technischen Hochschule at Berlin, and the somewhat surprising fact demonstrated that this substance, which has hitherto been regarded as possessing but little stability, is capable of actual distillation with scarcely any loss under reduced pressure.

In attempting to concentrate solutions of hydrogen peroxide in vacuo by the method of Talbot and Moody, and also in the open air upon the water bath, a solution as strong as 66 per cent. H_2O_2 was obtained, but with a loss of over 70 per cent. of the original amount of peroxide employed. Moreover, it was found that when the common commercial 3 per cent. solution is concentrated, the percentage of H_2O_2 may be brought up to 45 without the loss of any considerable quantity of the peroxide by volatilization, but that as the concentration continues to rise above this limit, the volatilization of the peroxide increases at a very rapid rate. For the great loss was proved not to be due to decomposition, but to actual vaporization of the substance.

Evidently hydrogen peroxide is remarkably stable at the temperature of a water bath. An attempt was therefore made to actually distill it under reduced pressure. A quantity of commercial peroxide which had been further concentrated until it contained about 50 per cent. of H_2O_2 was first purified from all traces of suspended impurities, and at the same time still further concentrated by extraction with ether. After evaporation of the ether the solution was found to contain 73 per cent. H_2O_2.

This solution was then submitted to distillation at the temperature of the water bath and under the reduced pressure of 68 mm. of mercury. The distillate was received in two fractions, boiling at 71°–81° and 81°–85° respectively. The first fraction contained 44 per cent. H_2O_2, while the latter was found to contain no less than 90.5 per cent. Upon again fractionally distilling the latter product, a large proportion distilled at 84°–85°, and this fraction proved to be practically pure H_2O_2, containing over 99 per cent. of the peroxide.

The liquid thus isolated is a colorless syrup which exhibits but little inclination to wet the surface of the containing vessel. When exposed to the air it evaporates. It produces a prickly sensation when placed upon the skin, and causes the appearance of white spots which take several hours to disappear again.

As regards the much-discussed and disputed question of the reaction of hydrogen peroxide toward litmus, Dr. Wolffenstein finds that even when the pure liquid is made strongly alkaline with soda and again distilled, the distillate exhibits strong acid characters, so that the acid nature of hydrogen peroxide must be regarded as fully established.

It is finally shown that the use of ether in assisting the concentration is by no means essential. Ordinary commercial 3 per cent. peroxide can be immediately subjected to fractional distillation under reduced pressure, and a fraction eventually isolated, consisting of the pure substance boiling at 84°—85° under a pressure of 68 mm.

1. Such cases have happened in Boston, Brooklyn, Cincinnati, San Francisco and elsewhere. In England similar cases have occurred—for instance, at Blackpool, Bradford and Preston; and these have caused the Board of Trade to make stringent regulations as to the conductors of electric tram lines.

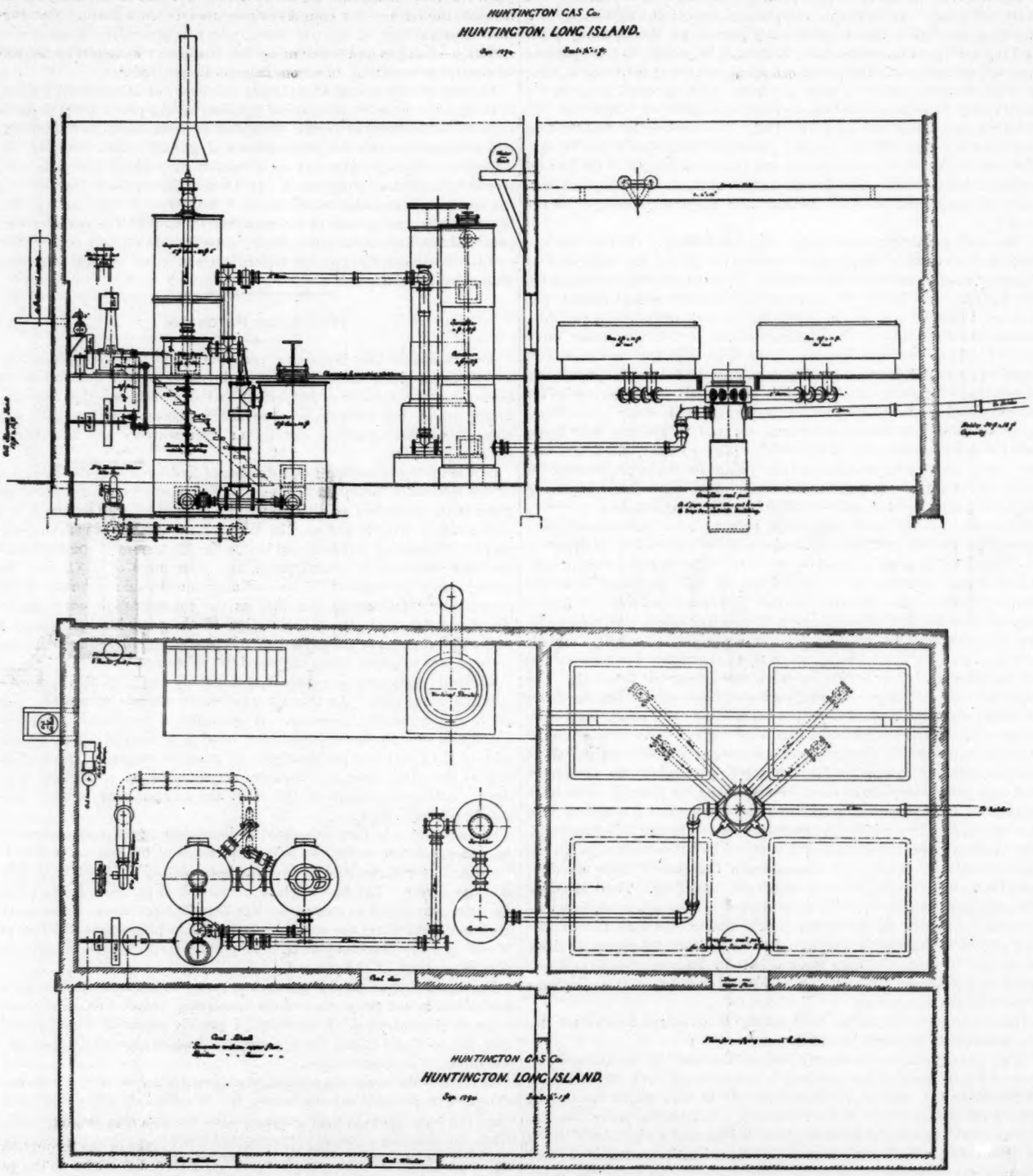
Plan of the Huntington (L. I.) Gas Works.

The accompanying plans show the apparatus in the gas works at Huntington, L. I., which were reconstructed from the designs of Mr. Edgar L. Street, of 44 Wall street, during the summer of 1894.

The arrangement shows what is probably the simplest form to which a small works can be reduced, consistent with the attainment of the best standard results.

It will be noted that the gas is driven direct by the pressure from the machine through the scrubber, condenser and purifiers to the holder, which is elevated above the works.

All drainage is by gravity, and there are no drip pots on the works. The overflow from the scrubber, condenser and center seal is collected in a common seal pot, from which it is taken to a separator box in the yard, where the heavier matter is trapped and the light liquid allowed to flow into the surrounding sand, where it is carried off by a strong underground flow of water. There is thus no discharge of any kind from the gas house yard.



The machine proper is of the well known Lowe type of water gas apparatus, and consisting of a generator, where hard coal is burnt and steam decomposed, and a superheater, in which gas naphtha is decomposed and mixed with the hydrogen and then fixed.

The arrangement of the double superheater in one shell, as shown in section, with double air-blast and oil injection pipes, is that first de-

signed and patented by F. D. Moses, of Chicago, and now generally adopted on this class of machine.

There are three oil injection pipes in the lower part of the superheater, it being found advisable to vary the height of the inflow of oil with the heat of the machine. These injectors are plain, ¼-inch pipes, and no attempt is made to spray the oil.

The injection of the oil is regulated by the operator by means of a small oil pump. As he stands at his post he has close at his hand: 1st, the oil pump; 2d, a glass column graduated with marks indicating the level of oil in the small supply tank outside the wall; 3d, a combination of valves for regulating the supply and destination of the oil and steam discharge; 4th, three test pressure gauges, which show the pressure at different parts of the apparatus; 5th, a test light which indicates the quality of the gas as it is generated; 6th, a boiler-feed pump of such a size that it runs continuously throughout the operation of making gas; 7th, an engine for driving the blower, which is slowed down when gas is making.

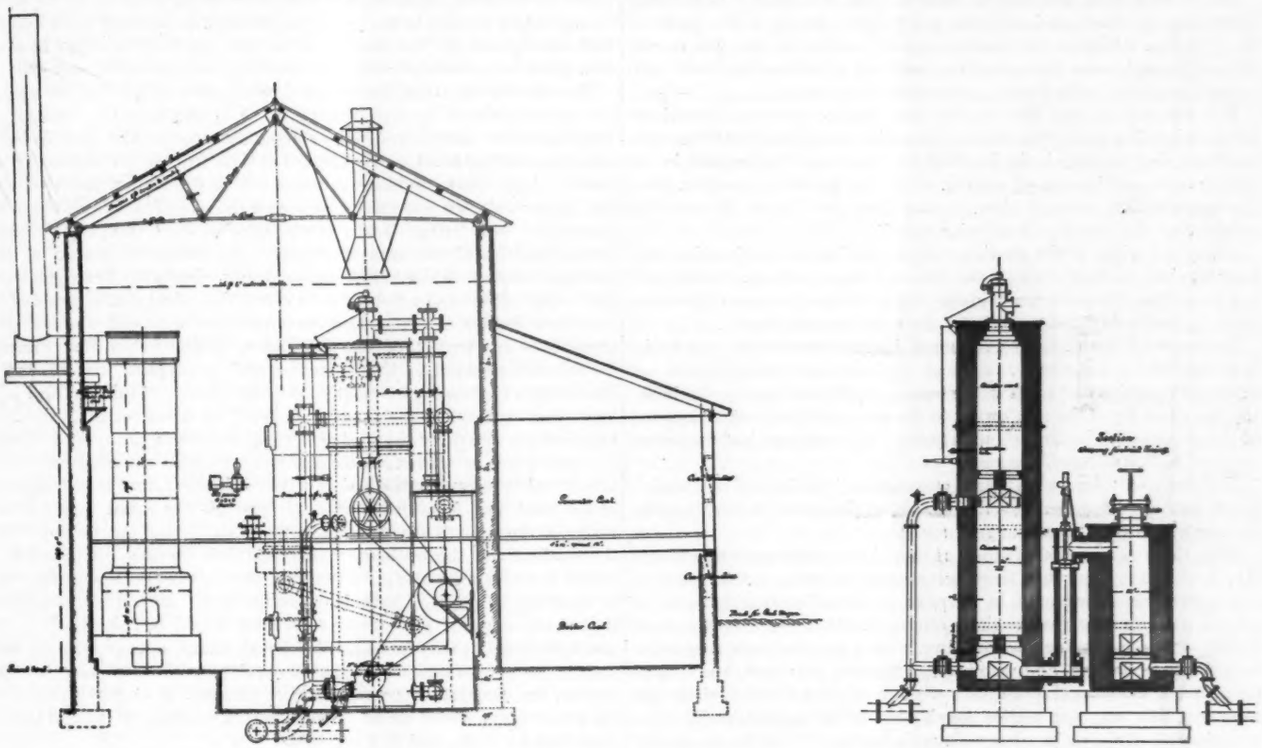
The boiler is of such a size that it only calls for attention about twice an hour.

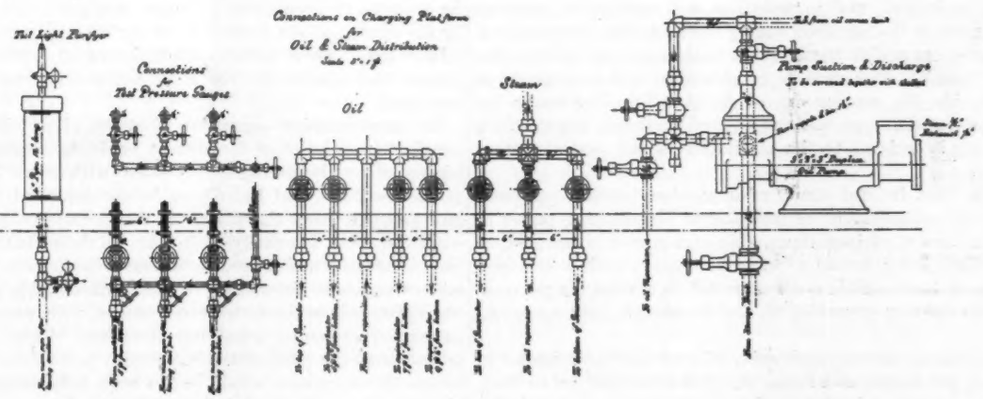
It will be noted that the roadway from which coal is delivered is of such a height that the generator coal is easily pitched on to a floor of the same level as the generator mouth and the boiler coal on the lower level.

The gas now made is of 20-candle power. A consumption of less than 55 pounds of hard coal in the generator and 4½ gallons of naphtha is required. Since gas is only made twice a week these results are secured with a machine comparatively cold at the beginning of the run, and with continuous work the quantities of material could be considerably reduced.

Every third run the valve in the combustion pipe is closed and a bye-pass opened between the lower parts of the superheater and generator. Steam is then turned into the upper part of the generator and thus flows downward and tends to keep the bed of coal at an equal temperature throughout.

The blast and bye-pass valves are all of the quick-opening type, and are operated by lifting-rods from the operating platform.





A Circulating Gas Supply.

By an "Occasional Contributor," in the *Gas World*.

To satisfactorily and efficiently distribute the make of gas throughout the area supplied from a works presents many difficulties to the gas engineer; and these difficulties are increased if the area of supply has, in addition to considerable variations of level, awkward terminal points and corners situated along its boundary. Whilst a gently increasing pressure may be obtained along one road, say in a northerly direction, owing to a uniform rise from the works, a low-lying district in the south, immediately under the nose of the works holder, so to speak, and without a district governor, may give constant trouble, owing to complaints of deficiency of pressure from users of gas engines, more especially from printers, who have to work against time with urgent

publishing orders. The illuminating power of the gas also necessarily suffers, as the time elapsing between the despatch of the gas from the works and its consumption frequently differs widely in the various districts supplied.

All the year round the clerks in a great railway office, with extensive basement, wield their pens (when they don't typewrite) in the light of gas burned within 300 yards of the gas works, and delivered through a 24-inch main; whilst Fitzsimmon's parlor maid, "Hazledene," Clayponds avenue, lights gas in the drawing room on a summer evening that has traveled five miles, passed the works governor 36 hours before, and is delivered through a 3-inch main.

The consumption per mile of main is often abnormally high along a few thoroughfares, and amounts to intensity during a few hours of the evening, whilst a few hundred yards further on the gas is wire drawn through some distance of the main before recovering itself, with a corresponding fluctuation in pressure and volume.

The demand for gas for cooking and heating purposes sometimes helps in keeping up a circulation in the mains during the day, although, as a rule, day cooking is the heaviest at hotels and restaurants in the city or center of the area of supply, while the suburban cooking, from the consumption point of view, is that done just before the evening meal—viz.: the late dinner of "city men."

Along the fringe of the district, "dead ends," small-sized mains, and long services do their work on the gas, and form perhaps, under existing conditions, the most unavoidable and permanent source of deterioration in the quality and quantity of the suburban gas supply.

Professor Vivian B. Lewes, in one of his lectures on coal gas, spoke in a lucid and convincing manner of the increased "skin friction" of the smaller mains and pipes at the terminal points of supply diminishing the illuming of the gas, owing to the dry scrubbing-out, as it were, of the condensable hydrocarbons, a point which, perhaps, had not before received sufficient consideration.

The effect of "dead ends" and consequent burning-out of "stale" gas before the consumer gets the benefit of the gas of a good quality are conditions well known to gas men.

With these conditions existing, as they do, in every area of gas supply, it will be evident that there are constant sources of discrepancies, and sometimes deficiencies, in the pressure and illuminating power at several points and at various times during the 24 hours. Given a small country town, a popular gas company, with a gas examiner very regular in times of testing, and who is also engineer, surveyor, and inspector of roads, drains and nuisances, with an uncle a director of the gas company, this may not matter much; but in the metropolis, with the ubiquitous L.C.C., or in a large manufacturing city with an equally pertinacious municipal body on the alert, it is a very different matter. Frequent and periodical, and unperiodical and unexpected, testings always being made at the scattered testing stations, with the abnormal vigilance of some councillor anxious to trundle a portable photometer and make a "splash," alter matters considerably, and necessitates, to be on the safe side, the sending out of gas 1½ to 2 candles above the standard. And not then can the engineer of the station always sleep soundly; he may be subject to the nightmare of the perambulating photometer.

Probably the most fruitful source of dissension between gas companies and local authorities is the variation of illuminating power in various districts and at various times. No explanation is accepted, or emergencies allowed for, by the average vestryman with a cast-iron opinion; a war of harrassment is often carried on against the gas company, the public lighting grumbled at, and the electric light coquetted with.

On taking a general and comprehensive view of the whole system of reticulation for gas supply to a town, one is at first sight led to compare it to the flow of blood in the arteries and veins of a living body. The action of the exhauster (heart) is the source of pressure, forcing the gas (blood) to the limits of supply at the extremities of the smallest mains (capillaries) at the fringes of the district (extremities of the limbs). Parallel influences of gravitation in the body and differences of level in the districts, with the exposure of some parts more than others to colds and chills affecting the circulation, are at work in both cases, influencing the quantity and pressure of supply at various points. But the great difference comes in, of course, at the point where the above comparison ends—viz., a return of the blood supply and a consequent circulation throughout the whole system. It requires almost as great an effort to imagine one's feelings at a temperature of 20° below zero, with an *absorptive* instead of a *circulating* blood supply, as it would to keep one's self warm under the circumstances; even the convictions of a Harvey would be inadequate to the task.

Bearing this difference clearly in mind, the question naturally suggests itself, Why not "Harveyize" our gas supply, and make it a circulating instead of an absorptive one. But by no means on anatomical lines, with duplicate main or return pipes. That, in addition to taking the gas away, would probably take the gas engineer's breath away also.

The advantages of such an arrangement will naturally present themselves on a little consideration being given to the question. To induce a gentle and continuous circulation throughout the system of gas supply would equalize the candle power in the several districts and prevent the accumulation of "pockets" of poor gas, nearly equalize local differences in pressure, and, furthermore, enable enrichment to be more economically applied to the returning poorer gas; it being well known that enrichment, by the addition of a rich gas to an average or poor one, gives better results with a low candle power gas to be enriched.

The circulation could be arranged in a system adapted to the extent and peculiarities of the area of supply. A system of radial mains converging on the gasworks or on a convenient spot in the area as their common meeting point, and connected at their further extremities by an outer "ring" main, dividing the area into wedge-shaped districts, like the spaces between any two spokes and the rim of a wheel, could be arranged. The "ring" main would take all the "dead ends" along the boundaries of the area of supply. An exhauster placed at the meeting point of all the radial mains would constantly draw gas from the "ring" main and points of inlet along the radial mains, preferably near their further extremities, at such a suction as would not lower the pressure in any portion of the distributing mains below that required for an efficient supply. Enrichment could be supplied just before the inlet of this circulating exhauster, to insure thorough mixing, and prevent that sometimes self-raised "bogey" of stratification, and the enriched gas delivered into the most effective spot in the system of supply mains for its thorough distribution. Suitable connections could also be made to reverse the action of the exhauster, and send a portion of the fresh gas from the works out through the radial mains to the limits of the area of supply to meet the other flow of gas issuing from the works along the ordinary mains, and thus increase the pressure at points some distance away. Of course, the drawbacks of expense, risk of drawing in air, etc., have to be considered. Still, it is conceivable that many areas of gas supply exist that would be benefitted by this arrangement. It may be urged that trunk mains, storage stations, and district governors now do all that is required in this direction; nevertheless, the circulating arrangement, if initiated at an early period of the gas supply, would do all (except actual storage, of course) that is now done by these, and at a less cost.

Public supplies of steam, electricity, hot water, etc., are distributed by a system of circulation, and why not gas? The writer was struck by the efficiency of a system of hot-water supply which he observed in a large hotel, where water could be drawn off at 250 different points in the extensive system of circulation, and at once was boiling hot at any one point.

As an alternative suggestion, a means of providing an ample gas supply at any point in the district could be arranged by a system of high-pressure circulating supply main (with turned and bored joints to reduce leakage), laid radially as before described, and of ample size, and supplied from the works as the ordinary outlet main from the works governor is usually connected. In these mains a higher pressure than is usually maintained in ordinary distribution would be kept up, with a constant circulation of gas. At suitable points connections would be made to the distributing mains, with district governors, adjusted or automatic, supplying areas and blocks, of smaller size, of course, than the usual districts of supply at present worked. By these means all consumers would have a near, independent, and direct supply at ample pressure, uninfluenced to such an extent as is now the case by the consideration of how many previous consumers the supply had passed. In these high-pressure mains the enrichment would take place, and through these, first of all, the whole of the gas consumed would pass, insuring a distribution of gas of equal illuminating power at all parts in the area of supply.

If gas is to take its proper place as the best source of instantaneously available motive power, it will not be by trickling and filtering towards its points of consumption in a haphazard way, diminished by the demands of previous consumers, but its near promise as the town fuel of the future must be met by an ample, direct, and certain supply carried out on liberal lines.

THERE is renewed talk of a gas works for Lodi, Cal., the projectors being Messrs. W. B. Ambrose and L. J. Locket.

Ex-Mayor Matthews in His New Role.

By Mr. A. E. Boardman.

The gas industry of this country has long been indebted to Massachusetts for taking the initiative in methods of management and control, as well as in appliances relating to the manufacturing department of gas companies. We have studied and watched with solicitude the effects of the control exercised by the Gas Commission in that State upon the properties operating under it. Now we have presented for our contemplation the peculiar outcome of the Boston complications, and we are invited to deduce such lessons as we may from the novel experiment about to be made in that progressive city.

To a careful observer of the progress of events and the political tendencies of the times, as they affect gas interests, the recent developments in the policy of the Boston Companies are certainly peculiar as well as novel.

Who would have anticipated, in 1893, that the then leader of a most energetic and somewhat bitter attack upon the policy, management and properties under the control of the Bay State Gas Company, of Delaware, situated in Boston, should, after an expensive fight and substantial victory, be asked, by the very men he so denounced and vigorously opposed, to take the entire and unrestricted management of the properties he strove so hard to injure? Nevertheless, that is just what has happened, and his Honor, Mayor Matthews, has been requested to take sole charge of the Bay State Gas Company's local business, after his retirement from the Mayoralty, and has accepted. He who directed the mighty forces of public greed, public prejudice and public clamor against private corporations and their properties, is now to attempt to quell the storm he has invoked and to save the properties he has so jeopardized. The result will be watched with absorbing interest by everyone interested in gas securities throughout the land. Unfortunately the power of man to destroy is greater than his power to create, and his Honor will find it a much more difficult task to repair the shattered fortunes of the gas companies than it proved to damage them, besides being a much less popular undertaking.

The cause of the recent troubles in Boston gas dates much further back than the incumbency of Mayor Matthews, and the results will be felt for a long time after he has taken charge of the gas works. It is hardly necessary, at this late date, to remind the readers of the American Gas Light Journal that the repeated encouragement given by our cities to so-called competing companies is the main cause of the generally high price they have to pay for gas and the extensive capitalization on which interest must be paid. Boston should not have encouraged the Bay State Company to enter into competition with her existing companies, nor given it the power to so depress the value of her gas properties as to enable it to easily gain control of them if she was not willing to stand the consequences. Ignorance as to what those consequences would be can not be urged as an excuse in this case; for it occurred so recently that it was a well-established and well-known result of experience, and one that even city officials should have known. Mr. Matthews, as Manager of the properties of the Bay State Gas Company, will regret more than once the powers for competition that Mr. Matthews, as Mayor, granted the Brookline Gas Light Company.

It is exceedingly unfortunate that many amiable and generally well-equipped men should, when installed in a public office, deem it necessary to impress the people with their energy in the public service by doing something that will make their incumbency remarkable. In their haste to do this they frequently introduce and press measures which, at the time and with the partial knowledge of the subject they then possess, seem just, right and certainly popular, but which, after further investigation and greater experience, they are obliged to acknowledge were hasty and ill advised. And, unfortunately also, there is no more inviting field for attempts at regulation by public officials than the affairs of such corporations as serve the general public under municipal franchises as do gas, water and electric companies.

Doubtless, upon entering public office, Mayor Matthews had very different ideas as to the relations that should exist between the city government and the gas companies from those entertained by him upon retiring from that office. It has been a "campaign of education" to his Honor to a greater extent than to the general public; and, although in his letter of acceptance of Nov. 14th, he distinctly states "that he has not changed, nor intends to change, in any respect the views publicly expressed upon the relations which ought to exist between the public and these semi-public corporations," at the same time he states that "competition in these matters is not in itself, or necessarily, a desirable thing from the public standpoint." In 1893, however, he did think it not only necessary but very desirable to encourage competition in these matters, although it was not by this means that the lower price of gas and lower capitalization of the Bay State Gas Company were attained.

The lower price was made by the Gas Commission after patient and impartial examination of all the conditions affecting the cost of manufacturing and distributing the gas, while the final proper capital on which interest should be paid was determined by a special commission appointed by the Court. Both results accomplished through the labors of arbitrators and *not* competitors.

The "large investment in extensions of its plant," made by the Brookline Company to enable it to "actively compete" with the other Boston Companies, "in several sections of the city," would not have been made, and the citizens would not have to pay interest upon this unnecessary increase of capital had Mr. Matthews known as much of the gas business in 1893 as he does in 1895. The task he has before him, and the ultimate consolidation of all the companies, which he recommends, would also have been simpler.

There will be some who will ascribe the offering and acceptance of the management of the companies controlled by the Bay State Gas Company as the consummation of a trade made during the fight, by which the war dogs should be called off and a "fat place" given therefor. To such this action of the companies will seem to be a dangerous example, which will tend to encourage such attacks against companies in other cities; for, who would not desire to use his brief authority so against a gas company that the result might be lower prices and increased popularity with the citizens at large, while a good salary and continued authority in another field for a term of years might be secured at one and the same time?

But, to one who understands the difficulties and trials that beset the manager of such undertakings, it must appear that in a remarkable manner the "punishment fits the crime." He who in a measure created, and certainly accentuated, the difficulties now confronting the Boston Companies, the active competition in several sections of the city, the restoring of confidence in the securities of the several companies, the payment of the fixed charges from earnings derived from an acknowledged low price for gas, and the obliteration of the distrust and animosity developed in the public mind by the recent accusations—he it is who must now face these and combat them. At every turn he will be confronted by Banquo's Ghost, and gory locks will be shaken in his sight for years. *Fat place*, indeed! His avoirdupois will certainly not increase, and it will require a very large salary to make life bearable.

The Bay State Gas Company is to be congratulated upon the revenge it will accomplish in the "kettle of fish" it has provided, and Mr. Matthews has accepted; but more so upon the results it may reasonably expect to follow its unique policy. It is certainly good policy to place the management of local interests in competent local hands, and the ability and energy displayed by Mr. Matthews in conducting the fight in behalf of the city prove him to be eminently fitted to lead the forces of the Companies in their efforts to regain the lost ground. No one can more effectively satisfy the doubts of the populace as to the equities existing between the parties to the late controversies than he who raised them; and no one can be found to take the management of the gas works who possesses the confidence of the people more thoroughly than does Mr. Matthews.

[Concluded from p. 47.]

The Asphalt Question.

By Mr. S. F. Peckham, in the *Journal of the Am. Chem. Soc.*

In a paper that I read at the Congress of Chemists,[1] held at the Columbian Exposition, I took the position that the residuum in use for softening asphalt that is made from petroleums consisting of paraffines, and that consequently contains paraffines, is not a solvent for asphaltum, and therefore is not a suitable material for an asphaltic flux; as when an attempt is made to incorporate the two materials, the result is a mechanical mixture and not a chemical union as it should be. I based my argument on the results of laboratory experiments, and I now gladly welcome Mr. Richardson to my side, as his very emphatic statements are based upon the much stronger proof of practical experience. In the paper above referred to I further maintained that the custom of "blowing" asphalt, or mixing it by the use of a current of air injected in the molten mass while heated to a high temperature is all wrong.

Mr. Richardson writes well, and he uses the word "scientific" in a way that sounds well; but I hazard the opinion that if he read more

1. *Am. J. Sci.*, Jan., 1894; *Paving and Municipal Engineering*, Aug., 1894.

and wrote less, his opinions would have more weight. The first "scientific" paper in which the effect of the prolonged heating of bitumens was discussed, was published by Boussingault in 1837. He says,[1] "after different experiments, the means that I have finally employed in order to free the bitumen of its volatile principles, consists in exposing it at a temperature of about 250° (C.=480° F.?) in a Gay-Lussac oil-bath until it no longer loses weight. This method is prolonged, as it is necessary to heat during forty-five to fifty hours, even when operating on only two grams of material." In a note he adds, "By this method it is impossible to determine the two principles of the bitumen, as at that temperature a part of the petrolene is oxidized and passes to the solid state or asphaltene." Technologists in petroleum have known for years that prolonged heating will convert paraffine petroleums into a solid residuum. It has also been known for years that California petroleums can be so manipulated by heat as to convert a large percentage of them into an asphaltic residuum that will contain varying proportions of material soluble in petroleum ether, carbon disulphide and chloroform, leaving a residue of coke, according to the temperature to which it has been heated. A patent has lately been issued from the U. S. Patent Office for a method or process for preparing these residues.

It seems incredible that the scientific adviser of a great corporation that has the reputation of seeking to control the asphalt paving business of the United States, should be ignorant of these facts. Why then this space occupied in the Mineral Resources of the United States, with descriptions of technological processes, that all of the knowledge possessed by the scientific world for the last sixty years condemns as unscientific?

Mr. Richardson has taken great pains to show that he found a good quality of "land asphalt" that contained, if I remember his figures, two per cent. less of matter soluble in petroleum ether than a fair quality of "lake asphalt." This difference he regards as absolutely exclusive of "land asphalt" for paving purposes. He then describes how this "lake asphalt" is refined. He does not say whether refined lake and land asphalt differ by two per cent. of matter soluble in petroleum ether or not. He then shows how the refined lake asphalt is softened with a material that, according to his own showing, will not form even a mechanical mixture with the melted asphalt, except by constant agitation with a current of air, and that, up to the point when the so-called cement is put into its final resting place upon the street. It is a fair question, whether lake asphalt after this wholly unscientific treatment does not contain a larger percentage of matter insoluble in petroleum ether than would land asphalt, when properly manipulated.

Mr. Richardson says, "Washington has had more experience with sheet asphalt pavements and more time and attention have been devoted to both the scientific and practical sides of the industry there than in any other city in the country."[2] If Mr. Richardson has faithfully represented the state of the art in this highly favored city, in what condition must the rest of the country be found where scientific principles have not been introduced into the industry?

Mr. Richardson has been giving his attention to the scientific principles underlying this industry for a number of years. I think it may be safely said that he has had a better opportunity to become an acknowledged scientific authority upon this subject than any chemist living. After what manner has he used this opportunity? He has published a large number of so-called analyses of asphaltum. When making these analyses he either found a method already in use, which his experience proved to be satisfactory, or he invented a better one. In either case, by long continued use, he made the method his own. I am not aware that he has anywhere described his method of analysis, but the terms in which he has stated the results of his analyses indicate his method with sufficient clearness. He states the amount of water, the percentage soluble in petroleum ether, the percentage soluble in carbon disulphide, the percentage of organic matter not bitumen, and the percentage of inorganic or mineral matter. It is a fair assumption that with Mr. Richardson's opportunities, he thoroughly investigated every step in this process of analysis, and is prepared to show that water, and not volatile oils or gases, are determined as water; that either petroleum ether of any sp. gr., *e. g.*, any light distillate of petroleum can be used in place of any other, with the same results, or that a distillate of a particular sp. gr., obtained from a particular petroleum should be used. It is further to be presumed that he is able to show that petroleum ether is the best liquid that can be used for this purpose, and that the separation made by its use is sharp and clearly defined. It is further to be presumed, that when this residue from which petroleum ether has made a complete solution is subjected to the action of carbon disulphide, that setting aside the difficulty of obtaining the reagent pure, its action is attended with no serious objections and is complete; that is, it dissolves every trace of bitumen remaining in the residue. All of this should have been proved beyond question years ago. But Mr. Richardson has apparantly allowed that two per cent. of difference between lake and land asphalt to so obscure his mental vision that he has left it to the careful and painstaking accuracy of Miss Linton to show that carbon disulphide will not dissolve completely the bitumen from asphaltum, and that boiling spirits of turpentine is an equivalent for carbon disulphide, and is a much more convenient and satisfactory reagent to use.[1]

There are mistakes to which everyone is liable and that are properly to be excused; there are others that are absolutely without excuse. I confess, that to my mind, there is no excuse for a man, who, occupying the position or responsibility that Mr. Richardson has occupied, publishes the results of analyses year after year, upon which, as a basis, it has been sought to influence the expenditure of millions of public money, when, in reality, he has made no proper investigation of his processes, and knows nothing respecting the accuracy or proper significance of his results. Mr. Richardson has no right to complain if his constituency hereafter repudiate all of the dicta that he has with, I had almost said, unpardonable arrogance thrust upon the public, in reference to the "Asphalt Question."

I have read the articles of Mr. Torrey with a great deal of interest.[2] They are suggestive. I have not found, by experience, that his method of analysis by solution in alcohol promises any superiority over that proposed by Miss Linton. The test of a method of analysis is, other things being equal, the parallelism shown in the results when duplicate analyses are made, side by side. In one instance, with her process, I have obtained results parallel to the third place of decimals. Such close correspondence in work of this kind is not generally to be expected; but the process, on the whole, has given me very satisfactory results, and the possibility of rejecting altogether the use of carbon disulphide is a great gain.

Messrs. Sadtler and Whitfield, remark in their article in *Paving*, "While some of the European asphaltic limestones are capable of being used for paving without addition of fluxing material, they have not been found to make as satisfactory pavement as those containing a siliceous base."[3] Why should they? Is not any form of calcium carbonate easily dissolved by rain-water or decomposed by weak acids, such as abound in the street gutters? Will Mr. Richarson please explain why pulverized limestone is required as an ingredient of the asphalt surface used in Washington? Why is it any better than the same amount of fine quartz sand? The reasons given above are sufficient reasons why it is not as good. In California, infusorial eath occurs in many localities in close proximity to deposits of asphalt. It is found to be a very superior material with which to temper asphalt.

On page 52 of the Report of the California State Mining Bureau, above referred to, an extract appears from the Records of the Standard Asphalt Co. There an attempt is made to compare some of Mr. Richardson's analyses of Trinidad asphalt, made with petroleum ether, with other analyses made by G. Q. Simmons, who analyzed California asphalt by using common ether. Other tests are given, made by H. Stillman, who used presumably petroleum ether from California petroleum. Miss Linton has shown that the solvent powers of these three reagents, when applied to the same asphaltum, vary widely; hence they cannot be used interchangeably, and results based upon their use cannot be compared. The material used should be petroleum ether of sp. gr. 700 equal to 70° B., obtained from petroleum consisting of hydrocarbons of the marsh-gas series—in other words, "paraffines."

These criticisms have not been made at the suggestion of, or in the interest of any party to the asphalt question.

1. *Am. chim. phys.*, 64, 141.
2. Mineral Resources of the United States, 1893, 653.

1. The Journal of the American Chemical Society, 16, 509.
2. *Paving and Municipal Engineering*, Nov., 1893; April, May and September, 1894.
3. Ibid, Sept., 1894, 120.

Loam and Dry Sand Molding Compared with Green Sand, as to Economy and Adaptation.

Mr. Simpson Bolland, at the last meeting of the Foundrymen's Association, read the following paper:

At pages 1 and 261 in "The Iron Founder Supplement," I have endeavored to trace the molders' art, as practiced by the ancients, from the earliest times of which we have any reliable record. Subsequent investigation of this interesting subject has thoroughly convinced me that cast objects of these remote ages were all executed in some form of

bronze or brass composition, the chief mode of molding being that which, by the French, is designated *cire-perdu*, meaning waste or lost wax.

The use of this alloy favored the production of some very superior specimens of founding, the object being first formed in wax by the sculptor or modeler, who subsequently inclosed his design in a plastic preparation and subjected the whole to a high temperature, which thoroughly dried his mold. The wax as it melts escapes through suitably devised apertures at the lowest extremities, leaving a clean and well defined space for the metal's reception.

One item of interest in this relation is worth some consideration by practical molders of this day—viz., that such molds naturally absorb a considerable quantity of carbon from the ingredients composing the wax, and thus, designedly or not I cannot say, these ancient practitioners in founding secured a highly refractory surface over every intricate portion of their molds, which not only rendered them impervious to the action of the molten bronze, but insured a comparatively smooth surface throughout the entire casting. How near we approach this elegant practice, with all our improved facings, I leave you to determine for yourselves.

The *cire-perdu* method is still in vogue at most foundries where bronze statuary is cast entire. These founders are, as a class, very exclusive even to this day, yet we observe that they are not slow in appreciating methods of construction which their less artistic brethren have devised for the accomplishment of common objects in iron and brass. Among other evidences of improvement over obsolete methods, we may now see an inclosing flask employed, in order to obviate the once universal mode of sinking pits in which to confine their molds for safe casting.

The same plastic material and manner of construction employed for bronze castings are inadequate for the production of castings in iron, otherwise there can be no doubt but we should have been able to discover some traces of iron castings before the early part of 1700, which date appears to be the earliest of which any trustworthy record of their production can be found.

An ancient historian, Pausanius, about 120, speaks of casting in iron and making statues of it, but the crude state of the mechanic arts then existing does not harmonize with its probability, because to mold statues in cast iron would have demanded a knowledge of materials and a degree of skill very superior to and much more exacting than that to which statue founders had hitherto been accustomed in the *cire-perdu* processes no doubt then prevalent.

I again quote from "The Iron Founder Supplement," which says: "The molding of statuary in cast iron is almost as exclusive as it is in bronze; the various manipulations must necessarily be more difficult, because the materials employed in the fabrication of molds for iron, being more open, are proportionately less tough, consequently greater ingenuity is demanded for their safe construction."

The human form has ever been the chief object upon which the genius and skill of the artist have been employed, and from this it is easy to determine where and how the art of dividing mold surfaces had its origin. Some sculptors not only formed the model but made the mold and conducted all the processes of casting also. Others, again, employed competent assistants for the less artistic branches of the business. These latter were, to all intents and purposes, the first practical molders, who, for a long time, continued to follow faithfully the practices common to statuary, even in the production of castings for domestic and commercial uses, as well as for such implements of war as were then employed.

How ingenious and complete some of these early contrivances were is unquestionably exemplified in many of the exquisite samples of artistic decoration which we discover were cast onto the numerous old bronze cannon to be found in nearly all parts of the world, the perfection of which is ample evidence of the whole model having been first fashioned in wax and the mold subsequently obtained by the *cire-perdu* process.

Very much of this refined mode of procedure might, with advantage I think, be more generally adopted by founders in some other lines of work besides statuary.

The infinite variety of what are technically termed drawbacks (means used extensively to-day in all classes of intricate molding), is but a reproduction of the clever false core system, established by the ancients thousands of years ago. True, their rude contrivances for constructing internal cores were only made possible where an exceedingly tough composition, composed of substances that were comparatively free from elements favorable to the production of gas, constituted the mold-forming material; which composition was also eminently adapted for casting thin bodies of bronze or other similar alloys, any of which congeal more rapidly than iron. Yet it cannot be denied that this ancient artifice was the nucleus from which has evolved the many elaborate contrivances from which must result, for a much longer period of time, the higher temperatures of molten cast iron and steel, and, at the same time, permit the free escape of much larger volumes of gas, incident to the use of materials which contain many elements that are favorable to its production.

There can be no doubt of the potter's wheel, which from time immemorial has been in use for forming circular objects in plastic clay, being the precursor of the loam molder's spindle of to-day; and we may conjecture how slow would be the progress of our progenitors in the loam molder's art, who, on the advent of the first steam engines and kindred machines, were then called upon to exercise their inventive faculties to mold the earliest cylindrical iron castings by that antiquated method. The services of the model maker would, we conjecture, be called into requisition for a time, to be finally retired in favor of the modern pattern maker, who could furnish a model of greater exactness from material of far more substantial qualities than plaster.

What are the distinguishing features of "loam," "dry sand," and "green sand" as practiced to-day, and how has each system been developed, are questions worthy of some consideration at this juncture. Loam molding is justly recognized as the leading branch, because it embodies, in the highest sense, every artistic feature or principle that underlies the noble art of which we speak. The loam molder's methods are to a great extent akin to those followed in the artist's studio; but with these he should combine a high degree of mechanical and constructive ability, in order that the objects he fashions, with or without the aid of a pattern maker, may be securely contained within a suitably devised mold. His strickles and sweeps constitute ample means for producing an infinite variety of shapes in the plastic substances he employs, and not unfrequently his hand and eye must be the only guide for the achievement of many tasks that are imposed upon him.

Green sand molding has, very naturally, many claims for distinction as a ready means of producing an almost endless variety of castings. The simplicity of impressing an object or pattern in the yielding sand could hardly fail to suggest this simple mode of preparing molds, even from the earliest times, and it only remained for time and experience to gradually develop it into its present advanced state. It must be remembered, however, that this branch of molding is confined within certain limits, and we may reasonably surmise it was when these limits were first reached that dry sand molding had its origin, in order that molds might be constructed of such a kind and nature as would effectively sustain extreme pressures and successfully resist the abrading influence of a violent flow of molten metal—conditions which, in extreme cases, are not met by a green sand mold.

In other words, a dry sand mold is simply a dried green sand mold, prepared from sand containing more binding qualities than the ordinary green sand mixtures. Such molds, when dry, present a hard, unyielding surface, similar in its nature to dried loam. This quality of hardness eminently fits it for every description of mold that has loose parts to be fitted together, and also favors the production of cleaner castings, simply because the mold itself is necessarily more compact and rigid than one in green sand could possibly be made; furthermore, if contained in a flask it may be placed at any angle for pouring that will favor the best results for both mold and casting.

Block and plate molding had their origin within the memory of some whom I am now addressing, and were the natural outcome of an extraordinary demand for light castings employed on the many machines that were being constantly invented for a more rapid production in the various textile industries.

The advent of the stripping plate was exceedingly opportune; shrewd mechanics almost immediately combined it with patent ramming devices; a remarkable combination, which gives us our modern molding machine.

The first really effectual attempts in this new departure followed immediately in the wake of Jackson's first gear molding device, which we must admit was the greatest step in advance of modern methods of molding that was ever made.

Before we proceed to inquire how and why one system of molding is superior to another for the production of certain lines of work, let me say that not a few of the earliest established system remain with us unto this day; noticeably the mode of making propeller wheels, which, if we except some minor variations, is an almost exact reflex of the practice in vogue when these somewhat complex castings were first made by our ancestors.

The testimony of many in this and other like organizations, along

with the widespread interest now manifested by metallurgists and engineers in almost all lands, goes far in proving the correctness of my views, published two years ago, that, in company with the educated engineer, the efforts of the practical molder may now be directed in paths which run in harmony with known physical laws; so that the art of founding must ultimately, and forever, leave the realm of conjecture and become as positive and progressive as any of the mechanic arts.

I am asked how loam and dry sand molding compares with green sand, and where and when any of these systems can be employed economically. Such a problem involves so many others of paramount importance as to make it difficult of solution without giving some attention to the issues so raised. For instance, it may be known to the heads of a firm that cost of production might be reduced in the pattern department as well as in the foundry, by making a certain casting in loam. Now, this is a contingency that can be met only by a molder and pattern maker whose ability is equal to the occasion. Too often the requisite ability is not available, and recourse is had to the green sand floor, with its extra risks and inadequate methods.

There are not enough thoroughly skilled mechanics in hardly any of our foundries at this day to allow of a free choice being made in these matters, and this would be very severely felt if business were to boom up suddenly.

This, you will observe, trenches upon the highly important subjects of education and apprenticeship—two factors that wield a marked influence in this controversy, and so claim the earnest and immediate attention of all such bodies as I am now addressing. Again, the disposition of the molder's share in production may be under the direction of some unqualified superintendent, in which case we need not look for gratifying results, unless he has wisely chosen for an ally a competent foreman molder.

We admit that the rapid changes now occurring in the general outfit of a first-class foundry compel a superior superintendence, in order that every mechanical improvement introduced therein may be employed in the best possible manner; but this fact still remains, that the cylinder, the propeller and the condenser of magnitude are, as yet—and what is more than probable, will continue to be—made on the old lines, thus commanding as much skill and energy for their production as ever they did. Therefore do not, as some are doing to their great loss, underrate the tried and qualified foreman molder, who must always remain a prime factor in the sum of foundry economics, and whose valuable services cannot possibly be dispensed with, but whose burden may be much lightened if generously aided by the trained minds of those above him. He may not be able to scientifically define the reasons for every line of action he pursues; but not all the colleges in the universe can impart to the practically uninitiated what a life's hard application and untiring energy has endowed him with.

These are some of the issues which, as previously affirmed, grow out out of it necessarily. Who, then, is to declare which of the systems of molding is best adapted for a certain line of casting, or, if you please, one particular casting? A chapter from my own experience will serve to illustrate some of the chief points in the subject under consideration.

When quite a young man I was employed by the Emmerson & Murgatroyd Company, Stockport, England, an eminent engineering firm who contracted to build the first of those immense floating piers that were erected at Malta and Bombay. The first order of 60 hydraulic cylinders, over 30 feet long, about 12 inches bore and 12 inches thick, was offered to every founder of note in the British Isles, who all refused to accept a contract of such unprecedented magnitude; the extreme length of these cylinders being, of course, the principal cause of their refusal. In their extreme dilemma, the aid of another eminent engineer was solicited, who at once assumed full direction of this colossal undertaking in a truly masterly manner. He immediately secured suitable premises on the north end of Liverpool, in the immediate vicinity of convenient docks, the ground chosen being a hillside which was excavated the requisite distance in from the road, to form the casting pit proper, beyond and around which, at the summit, he caused a foundry floor to be leveled, walls built, and cupolas, ovens, and all other requisite appurtenances to be conveniently located. Power traveling cranes controlled the whole length, and boring lathes occupied a position near the open mouth of the pit. A substantial roof completed what, with justice, might be termed a unique foundry. While all this was progessing, this active manager was pursuing a course of experiments at the old foundry, in order to obtain a mixture of iron that would meet the demand for strength and density which the Government insisted upon. He asked for a molder to assist him in these labors and also to advise with in reference to a suitable method in constructing the molds. I was ultimately prevailed upon to act in that capacity, with some reluctance it must be confessed, as I did not relish the very positive manner of my educated associate, and, it was not until he had demonstrated how little I knew of the science of my trade, as well as his capacity and willingness to teach me, that I eventually thawed out of my reserve. He freely acknowledged his need of just such practical information as I and others were able to impart; the result being that sets of castings and core barrels, with other needed equipment, were dispatched to the new foundry, which, with some few subsequent alterations, were the means of producing all the much-dreaded castings in fine style.

For information I will state that the outside was formed in dry sand, about six male and female cast-iron casings constituting the entire length of over 30 feet. A suitable match-plate received a turned-iron pattern and a casing, endwise, within which was rammed about six inches of carefully prepared sand. The mold bottoms were prepared in fire brick with a coating of highly refractory composition. The core barrel was suspended in the mold by a tripod at the top, and was necessarily made in two lengths and joined together, after the manner described and illustrated at page 272 in *The Iron Founder*.

To have molded the foregoing in green sand was utterably impracticable, for the reasons already advanced. If the sections had been of brick only, then each casting must unquestionably have been rammed in a pit or curbs, and to have swept each casting in loam, as for ordinary castings, was considered too risky on account of the large body of iron, which must inevitably have destroyed the casings by overheating; all of which annoyances and dangers were entirely obviated by the means so satisfactorily employed.

There are very numerous examples of molding in our everyday experience, where it needs but a modicum of consideration to prove the correctness of some well established systems. In this category may be mentioned car wheels, straight socket pipes, all plain pans and kettles, and many other special lines of castings that are always in active demand. Such examples, after long years of anxious and unremitting experiment, have finally settled down into their respective grooves as we now see them.

Stripping and match plate molding, with their admirable systems of interchange, are being gradually established among us, and only the least progressive founders fail in reaping the unmistakable advantages accruing from their use. But, when we see the part which these important methods are made to play on the latest molding machines, we are forced to the conclusion that even greater surprises await us in that direction than any to which we have hitherto been treated.

These and other valuable additions to the regular foundry equipment are producing unlooked for changes in the manipulation of many lines of work, making it difficult just now to outline any scheme that would be accepted as final. To illustrate: a certain firm, engaged for many years in the manufacture of pumps, would occasionally change their mode of casting the cylinders, ostensibly with the view of overcoming some special fault, but really to discover, if possible, a cheaper way to mold them. On one hand it was claimed that inasmuch as it took a molder and his helper a day to produce two castings, in either dry or green sand, cost of drying left a slight margin in favor of the latter method, an argument which I am persuaded was fully met by the more uniform success which accompanied their being cast in dry sand. In the meanwhile, and during the time this subject was in debate, a new iron pattern was prepared and duly mounted on the molding machine, the result being that instead of paying about $1.75 per cylinder for molding they are now produced for about 70 cents, the machine very satisfactorily solving a problem that had been agitating the firm for years.

When the respective merits of these different systems of molding are under consideration, it is well to remember always that it requires relatively less skill to mold a similar casting in dry than it does in green sand. Reasons for this assertion are easily discovered, and are as follows: 1. If the material used is of the correct nature and thoroughly dried, little or no venting will suffice ordinarily, unless it be to carry off steam and thus facilitate drying. 2. The molds being dry require a minimum of artificial helps to bind them together, hard ramming sufficing in most cases. 3. Mold finishing is slightly different to green sand, but practice soon dissipates that difficulty. 4. Dry molds are closed with greater facility and more safety than green ones, and, besides many other advantages which might be enumerated, it is certain that unskilled help can be easily trained to ram the molds, something invariably out of the question in green sand.

We may safely conclude that where large numbers of castings which, besides boring and fitting, must present a more than ordinary finished

and clean appearance, it is true economy to proceed at once in making ample oven provision, rigging up the requisite number of flasks, and, by establishing a rigid and systematic rule of order, insure a constant output of creditable castings.

This is sound doctrine and might, with profit, be applied in numerous instances where slipshod systems in green sand are followed through ignorance of any other existing method. Unsuccessful attempts to mold castings in green sand are being made every day, some of which are truly very difficult of accomplishment by that means, but which, in the hands of a competent dry sand molder, would have been but a very ordinary task, and a loam mold could have been constructed for them with equal facility. In fact, I have never hesitated about sending a pattern to the loam or dry sand floor when, for any reason whatever, its successful accomplishment in green sand was doubtful.

Aided by the intelligently assorted grades of siliceous sands and the many good carbon facings now so common, the possibilities in green sand moldings are enhanced to a remarkable degree, and it has come within the range of my experience to produce some elegant castings by this means; but where accuracy of outline and strict adherence to dimensions are to be observed absolutely, loam or dry sand, with their comparatively rigid surfaces, must always be preferred to the yielding materials of which green sand molds are of necessity constructed.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Tacoma Gas and Electric Company, of Tacoma, Wash., has been incorporated for the purpose of taking over and operating the Tacoma Light and Power Company and the Commercial Electric Light and Power Company, the plants of which were recently secured by a syndicate, prominent in which are Messrs. Seymour, Barto & Co., and Chas. B. Hurley. Mr. William G. Gaston, Secretary and Treasurer of the old Tacoma Company, will have charge of the office works of the consolidated corporation, and Mr. Hurley will manage the works' end of the enterprise. He proposes to push the sale of gas for cooking and heating.

THE proprietors of the Burlington (Vt.) Gas Light Company have purchased a 20-acre plot known as the "Cove lot," which we presume means that the plant will be eventually removed from its present location on South Battery street. The "Cove" site can be conveniently reached by boat or rail, and is in every way vastly better adapted for the Company's purposes than is the one occupied by it now.

MR. WILFORD C. SMITH, Secretary of the Newark (Ohio) Gas Light and Coke Company, ordered two tramps out of his barn, and was set upon by the intruders. Having clubbed him until he was senseless, the wretches set fire to the barn, and before the victim was rescued he had sustained injuries of such severity that his death occurred in a few hours.

AT the annual meeting of the Le Roy (N.Y.) Gas Light Company the officers chosen were: President, D. J. Bissell; Treasurer, C. F. Bissell; Secretary and Superintendent, John C. Bissell.

AT the annual meeting of the Board of Directors of the New Haven (Conn.) Gas Light Company the officers elected were: President, A.W. DeForrest; Vice-President, Pierce N. Welch; Secretary, G. Morse, Jr.; Treasurer, I. J. Wild. Following the regular routine business, the special report of a committee of the Board (Messrs. DeForrest, Welch, Brush and Watrous), appointed at the December meeting to consider the matter of ordering a reduction in the selling rate, was discussed. The committee recommended a cut of 25 cents per 1,000 cubic feet, and the matter was eventually disposed of by the passage of the following resolution: "*Voted*, That the price of gas be reduced to $1.25, net, per 1,000 cubic feet, said reduction to take effect from the quarter beginniug March 1st, 1895." This equals the net rate at Hartford, Conn., and goes to show that the New Haven folks are at last up to date. In passing it might be well to note that the taxes paid by the New Haven Company, per 1,000 cubic feet of gas sold, amount to 12 cents, which fact seems to bear out the statement that the Company is doing its full share towards paying for the maintenance of the State, county and city.

THE Trustees of Salinas City, Cal., have asked the proprietors of the Salinas Gas and Water Company to name the price at which they will dispose of the property entire to the city. They are also asked to name separate prices for the gas, water and electric light divisions of the corporation.

SILVER LAKE is a beautiful sheet of water in Wyoming county, N.Y., the ice harvest from which is the source of income for many of the woodsmen in that section; and the work of cutting this year is going on day and night, the Silver Lake Ice Company having installed an arc lighting plant to expedite the cutting.

AT the annual meeting of the Williamsport (Pa.) Gas Company the following result was reached: Directors, B. C. Bowman, H. Mudge, John G. Reading, Jr., R. C. Reading, H. H. Piggott, John F. Laedlin and John M. Dean; President and Superintendent, R. C. Reading; Secretary and Treasurer, George E. Rentz; Assistant Superintendent, M. J. Winters; Solicitor, John G. Reading, Jr.

A CORRESPONDENT at Liberty, Ind., forwards the following: "A.W. Snyder, of Liberty, Ind., a member of the National Gas Company, has been sent to Martinsville, Ind., by the stockholders of that Company. Mr. Snyder claims that the National Gas Company has the exclusive right to operate and establish all gas plants making illuminating or fuel gas by the Parker process in the States of Ohio and Indiana. Mr. Snyder brought with him the letters patent for the manufacture of the Parker gas, the contract in which L. C. Parker, the patentee, transferred the right to manufacture the gas under the process to George W. Benedict, of Connersville, one of the largest stockholders in the National Gas Company. Mr. Snyder submitted the papers, the deeds and contracts entered into between L. C. Parker and George W. Benedict to Jordan & Matthews, for an opinion as to whether they have good cause for action against the Martinsville Gas and Fuel Company, now operating the gas plant in Martinsville. An action for infringement on territory will be brought against the Martinsville Company. After examining the deeds, letters patent and contract made between Parker and Benedict, the attorneys gave an opinion that there was good ground for a cause of action for royalty or for an infringement on territory. L. C. Parker is a member of the National Gas Company; Snyder claims that the Martinsville Company was not granted permission to put in and operate a plant of the Parker type in Martinsville; in fact, he asserts the privilege was never even asked for. Mr. Snyder is endeavoring to place the stockholders in the Martinsville Gas and Fuel Company, and although he was sent to quite a number of persons who were reported to be stockholders, he could gather no facts in the matter. H. J. Burt, of the Martinsville Company, however, declares that a thorough investigation of the case will show that the National Gas Company has neither part nor title in the interests of the local Company."

A CORRESPONDENT at Portland, Ore., furnishes the following interesting matter respecting the history of the gas supply of that city: "The legislative assembly of the Territory of Oregon, on January 7, 1859, granted to Henry D. Green, since deceased, a perpetual right to manufacture and sell gas in the city of Portland. By the terms of this Act Mr. Green was to enjoy the exclusive right to conduct a gas works in the city for a period of 15 years after the Act went into effect. At that time there were but two gas works in operation on the Coast—one at San Francisco, the other at Sacramento. In the same year that he obtained this charter from the Legislature, Mr. Green commenced the erection of buildings in Portland in which his proposed gas works were to be located. In May of the following year gas from these works was first turned into the city mains, and the day when the gas jets in the city were first lighted was one of great rejoicing. It was a gala day for the entire population of Portland, and everybody regarded the establishment of gas works here as one of the great events in the history of the city. The first subscribers for gas from Mr. Green included six of the leading business houses of the city. The rate established was $9 per 1,000 cubic feet. In 1862 Messrs. John Green, H. C. Leonard and Henry D. Green incorporated what was known for years as the Portland Gas Light Company, with a capital stock of $250,000. The subscribers to the stock were the three incorporators, Capt. W. L. Dall, W. L. Leonard and Major R. W. Kirkman. On December 11 of the same year the stockholders held their first meeting. At this meeting John Green was elected President, H. C. Leonard Secretary, and H. D. Green Superintendent. By 1876 the consumption of gas had so increased in Portland that it was found necessary to enlarge the plant and to provide for a further extension of the mains. At a meeting of the stockholders, held November 27, 1885, it was again decided necessary to further enlarge the plant of the Company, and its capital stock was increased to $1,000,000. It was decided to greatly improve the plant and to purchase the latest improved machinery and all modern appliances for the speedy and successful manufacture of gas on a large scale. These changes and improvements were made under the direction of Homer

Bloomfield, a thoroughly competent gas engineer. On the completion of the new works Portland was able to boast of one of the most efficient gas producing and distributing plants in the United States. The gentlemen at the head of the gas works in the early history of Portland were men of great enterprise, and their efforts resulted in affording Portland every facility for obtaining illumination of the highest quality at the lowest possible rates. In the summer of 1892 the stockholders of the Gas Company decided to retire from active business. The interests of these stockholders in the old Company were purchased by Charles F. Adams and A. L. Mills, prominent young men of Portland, and the transfer was made on August 1, 1892. The property transferred included about 20 miles of gas mains and a gas plant up to the manufacture of 700,000 cubic feet per day. The purchase price was $950,000. The new owners immediately incorporated what is now known as the Portland Gas Company. Many of the leading men of Portland subscribed for the stock in the new Company, and it is to-day one of the strongest corporations in the Pacific Northwest. Since the retirement of the old Company from this field the gas works and the distributing system have been greatly improved. Larger mains have been laid on the west side of the river, the old East Portland gas plant has been purchased, and a main has been carried across the Burnside street bridge for supplying gas to the East Side residents direct from the works in Portland. An ammonia plant has also been added to the Portland works. The rates for gas have been reduced from time to time from $9 per 1,000 cubic feet in 1860 to $2.50 per 1,000 cubic feet at the present, and special discounts are allowed where certain conditions are complied with. Gas is furnished, too, for cooking, heating and power purposes. The plant of the Company, as before stated, is a complete one in every respect, and it is fully capable of meeting every demand of a city of much greater population than Portland for gas of a high quality."

THE Berlin Iron Bridge Company, of East Berlin, Conn., is putting up a new retort house for the Ellerslie Gas and Coke Company, at Winifred Junction, West Va. The building, which is 66 feet wide and 84 feet long, is to have an iron roof covered with slate.

"WESTERN OBSERVER," writing under date of the 13th inst., from Chicago, says: "Dear JOURNAL—That our Galesburg (Ills.) friends are right in line can readily be understood from an examination of the following notice recently printed in the local papers by the proprietors of the Galesburg Gas and Electric Light Company: 'Gas consumed after January 1, 1895, will be charged for at following rates—price is based on each separate meter one month, provided the bill be paid by the 8th of the month, otherwise next highest rate will be charged: 5,000 cubic feet or over per month, one meter, $1 per 1,000; 3,000 cubic feet or under 5,000 cubic feet per month, one meter, $1.20 per 1,000; 1,000 cubic feet or under 3,000 cubic feet per month, one meter, $1.40 per 1,000; 500 cubic feet to 900 cubic feet, 15 cents per 100; 100 cubic feet to 400 cubic feet, 20 cents per 100. Twenty-four candle gas at $1 per 1,000 is the cheapest and most convenient light and fuel in the market. A burner consuming 5 cubic feet per hour of 24-candle gas costs but one-half cent per hour, and the low rate can be reached by all who use gas for light and fuel.'——I find gas matters generally in a very prosperous condition all through the West, although some of the Nebraska towns present a different showing; but if nothing more out of the ordinary turns up they will all come out smiling in the spring. The present snow storm is quite general, and it ought to prove a good thing for all interests in the West.——Chicago gas matters appear to be badly mixed up, and if current stories and newspaper accounts are to be credited, the new Directory will have several New York and Chicago capitalists not in the present Board. Perhaps I may be able to send you more news about it before your next issue.——The Fuel Gas Company, of Louisville, Ky., has been able to handle from 300 to 500 extra consumers this winter by the aid of its auxiliary fuel gas plant.——The water gas plant at Cincinnati, Ohio, has been idle all winter. General Manager Keenan still clings to coal gas.——The Duluth (Minn.) deal seems to be hanging fire. It always takes a long time to sell a plant to a city.——Springfield, Ohio, has put in a combined oil, water and air gas machine. The machine or appliance was designed and built by the same man who put in the plant for the city of Bellefontaine, Ohio. The Bellefontaine experiment was not a howling success at first, but has been rebuilt and is doing well now, I understand.——The Columbus (Ohio) Gas Company has purchased a site for a new plant, but there is no immediate prospect for the construction thereon of a new works.——W. W. Taylor, the missing Treasurer of South Dakota, was connected with a gas company that owned a process which was to revolutionize the present fuel gas systems. The Company in question sold one plant to the Menominee (Mich.) Gas Company, but Brother Elbert is making coal gas there at present."

On the evening of January 9th an explosion occurred in the meter room of the Joplin (Mo.) City Light and Fuel Company, that caused damage amounting to perhaps $2,000. The gas service to the city was shut off for a few hours, but President Ma'in and his men speedily put an end to the interruption. The escape that brought about the explosion was traced to a curious cause. In a small room directly over the meter room an old electric dynamo stood on a frame the supports of which gave way, the dynamo falling on the floor with a force sufficient to break through the floor plank into the meter room, the dynamo eventually landing on the connections to the station meter. The leaking gas of course found its way eventually to a lighted burner, with the result above noted.

THE authorities of Covington, Ky., are urging a reduction in the gas rate. According to their ideas, the Company would not in the least degree injure itself by ordering a cut in rates equal to about 20 per cent. Meanwhile it is well to remember that the current rate there is by no means a high one.

A NEW ambulance house has been established at North Adams, Mass., and Colonel Frank S. Richardson, the clever Manager of the North Adams Gas and Electric Light Company, proposes to light the structure free of charge.

THE public lighting of Worcester, Mass., is accomplished by means of 2,417 lamps of all classes—434 arcs, 40 incandescent electrics, 241 gas and 1,702 gasoline.

AT the annual meeting of the Dover (N. H.) Gas Company the Directors chosen were: Messrs. Amos Paul, Thomas B. Garland, E. V. Brewster, John Holland and Charles H. Sawyer. Subsequently the Directors perfected the following organization: President, Eli V. Brewster; Secretary and Treasurer, T. B. Garland.

AT the instance of Mr. Holden an order was recently passed directing the Mayor to cause gas lights to be substituted for incandescent electric lights on the streets of Quincy, Mass., wherever such substitution was possible.

THE offices of the Ballston Spa (N. Y.) Gas Light Company have been removed to No. 22 Milton avenue.

THE Directors of the Hartford (Conn.) City Gas Light Company for the ensuing year are: John P. Harbison, Francis B. Cooley, James L. Howard, Henry K. Morgan, George S. Roberts, Hugh Harbison, Atwood Collins, Nathaniel Shipman and Rodney Dennis.

THE following ordinance for the governing of the gas supply of Davenport, Iowa, is now under consideration by the Council of that city:

Section 1. That any person, firm or corporation granted franchise under which the public streets, alleys and places of the city of Davenport, are occupied by pipes or conduits for the transmission of gas for fuel or illuminating purposes, shall, upon receiving a written request so to make connections with, and supply gas to the owner or occupant of any building or tenement, or part of a building or tenement, provided such owner or occupant complies with all reasonable rules and regulations prescribed by such person, firm or corporation governing the payment for such service, not in conflict with this ordinance.

Sec. 2. Any such person, firm or corporation shall, upon the written request from the owner or occupant of any building or tenement, within a reasonable time, make all necessary connections and place a correct and proper meter or other device for the measurement of gas, in such building or part of building, if such owner or occupant shall pay, or agree to pay therefor, the necessary expense of laying a service pipe connecting the main pipe of such person, firm or corporation with such building or room, and shall pay, or agree to pay, a sum not exceeding 50 cents per month for gas consumed, or to be consumed, in such building or part of building.

Sec. 3. Any such person, firm or corporation, manufacturing and supplying gas in this city, in case less than 250 cubic feet of gas be consumed, shall be entitled to collect not to exceed 50 cents for each month, from the owner or occupant of any building or tenement, or part of building, in which a gas meter be placed, and shall credit the account of such occupant or owner with having paid for not less than 250 cubic feet of gas for each month, and such owner or occupant shall not be liable for any sum in addition to said 50 cents until the amount that is actually consumed exceeds all such credits; provided that if the actual

consumption of gas, as indicated by such meter, be less than 3,000 cubic feet for any one year ending on the 31st of December, then such person, firm or corporation shall cancel all unused credits of gas paid for and balance the account of such owner or occupant for the year; and such owner or occupant shall pay, or cause to be paid, at a rate not exceeding $1.75 per 1,000 cubic feet for all additional gas consumed in the ensuing year in excess of the 250 cubic feet for each month of such year paid for by said minimum charge of 50 cents per month.

Sec. 4. Any person, firm or corporation, engaged in the business of manufacturing and supplying the public with gas, and having the right to place their pipes in the streets or public places of this city, shall not, for the purpose of laying or repairing any such pipes, take up or disturb any paving, or excavate any street, except in accordance with the provisions of Chapter 130 of the Revised Ordinances of 1893 of said city.

Explosives in Coal Mines.

The commission appointed by the North of England Institute of Mining and Mechanical Engineers to make tests of flameless explosives for mine use, has presented its report to that body. The tests were made in the Lower Duffryn Colliery at Cefn Pennar. In the first instance they conducted a series of experiments in the rock face with ordinary loose powder and subsequently with compressed powder, confined in a loosely tamped bore hole, 2½ feet deep, to induce blown out shots, with the coal dust placed under conditions similar to those of a coal pit working, but which failed to ignite the coal dust, the same being simply blown into the air in a cloud of black dust and not charred. This was repeated many times, but although in each case the blown out shot emitted a large flame, from 4 feet to 6 feet long, the coal dust was not ignited. After three other attempts in a new bore hole, 3 feet deep, with cartridges of loose powder, Manager Jones did succeed in igniting the coal dust with the second shot (1½ pounds of powder), but failed to ignite the dust with compressed powder in the third or last shot of ordinary blasting powder. Experiments were then conducted with patent meal gunpowder, specially prepared by Messrs. Curtis and Harvey, to show the difference between this improved method and the old system, under the above conditions, when no flame was seen, but sparks were given off from the unconsumed cartridge paper, which had no apparent effect on the coal dust. A cartridge of the same description of meal gunpowder, but in combination with ammonia solution, was next employed; still the blown out shot emitted no flame whatever, although a few sparks were seen from the ignited cartridge paper, but of course this had no effect on the coal dust. As a final experiment, a safety cartridge of meal gunpowder with ammonia solution was employed and tamped hard in the hole, just as it would be under ordinary conditions of use. Under these circumstances it was proved to be impossible to blow out the tamping and consequently the cooled down flame. From this it may be inferred that there is no possibility of igniting the coal dust. The extraordinary effect of this last shot was apparent, as the total darkness was not disturbed by any sign of light whatever, and stood out in marked contrast to the dangerous flame emitted by the ordinary blasting powder cartridges. These shots were fired by electricity.

After a careful consideration of the above and other tests, the members of the commission are unanimous in arriving at the following conclusions:

(1) That we consider carbonite a safe and effective explosive for blasting hard top or bottom, such as rock or clift.

(2) That for blasting in the coal, we consider that the meal gunpowder with the ammonia preparation aforementioned, is as safe as any of the high explosives at present used, whilst it retains in every respect the properties of ordinary loose powder for spreading and not crushing the coal.

(3) That carbonite, when used in the coal, produces a large quantity of small coal in the immediate vicinity of the explosion or back of the hole.

At a subsequent meeting of the North of England Institute of Mining and Mechanical Engineers, these tests were discussed. Mr. Henry Hall, an inspector of mines, reminded the members that there was a great deal of difference in the behavior of gases underground; some of them when ignited showed a long cap and some a short cap. He himself had ignited pit gas with a red-hot poker, but they might seek a pit through before they would find gas which they could ignite again in that manner; still, very inflammable gas did sometimes appear in pits, and that which appeared from freshly cut coal faces would be more readily ignited than gas which had been merely pent up or traveling any distance along the roadways of the mine.

Questions also arose which might do away to some extent with safety, such as the bulk of the flame brought in contact with the explosive mixture. In these experiments very small charges were used; possibly if larger charges had been used—charges such as would be used underground in firing shots—some of the results might have been different; for he believed it was admitted that even flame of a fixed temperature if applied long enough would sometimes light a substance which it would not if just applied for an instant—that is, if they had a small flame they might escape lighting a certain mixture, but if they had a large flame of certain temperature the mixture might become ignited.

Bearing upon this he thought it most important that the future experiments should take this point into view—that instead of dealing with an ounce of the explosive they should deal with the usual charge exploded underground. He thought if there was a weak point in the experiments it was in regard to the small charges of explosives that had been used. In addition to the danger of igniting mixtures of firedamp and air underground with explosives, there was also the danger of igniting coal dust, and it would almost seem from experiments which had been carried out that coal dust would be more readily ignited than mixtures of firedamp and air. Possibly that arose from the fact that coal dust was ignited by bringing it into contact with a flame which had the effect of heating it and so distilling gas from the coal. The gas thus distilled was not firedamp, but more nearly approached lighting gas or coal gas, and as had been shown and as was known, that kind of gas could be lighted by a flame of lower temperature, so that possibly dust might be ignited with an explosive of this kind when it would not ignite gas and air.

There had been some recent experiments at Wigan, which went to show that nearly the whole of these explosives, when fired in charges of 1 lb. weight and without any stemming, in every instance had lighted the coal dust. One of the exceptions to this was a new explosive called westphalite, and another he thought was ardeer powder, possibly also carbonite. In each case a charge of 1 lb. was fired into coal dust without any gas. But, although the experiments had shaken, and he thought still would shake, their confidence in the safety of these high explosives; yet he thought there could be no question but they were much safer than the old-fashioned explosive. He thought this came about more especially from two causes—first, that when using high explosives, they were not nearly so liable to blown-out shots, and blown-out shots were the real cause of the danger; and, second, that the ignition of the firedamp mixtures did not depend so much upon the temperature of the flame as upon the rapidity and the instantaneousness of the flame, no matter how hot the flame might be if it passed so quickly that it had not time to ignite the mixtures.

Injury to Boilers by Grease.

It has often been observed that small quantities of grease in combination with deposits lead to boiler accidents. This compound gets deposited on the plates, and the most violent water circulation is sometimes insufficient to remove it. The plates, in consequence, get overheated and accidents arise. The introduction of grease inside the boiler should be avoided, especially where the water from the condenser is used for feeding the boiler, by the use of a sufficiently large feed-water filter. The Berlin Boiler Inspection Society had the following case brought under its notice: Two single-flued boilers, 4 feet 8 inches diameter, 23 feet long, flues 28 to 22 inches diameter, pressure 12 atmospheres, were used to generate steam for a 150-horse power engine with surface condenser. The installation had only been in work since July, 1893. A considerable portion of the flue of the left boiler had collapsed. This could not be attributed to shortness of water.

On examination it was found that nearly all over the boiler a fatty brown slime had been deposited, which, being placed on a red hot iron, burst into flame. The feed-water pump got its water from a large open tank over which a small filter was placed. The condensed water was led to this filter in order to have the grease removed. Unfortunately, the arrangements were so bad that a considerable portion of the grease found its way into the boiler. A similar case was recorded by Mr. Abel at the last meeting of the Markisch Society of Testing and Inspecting Steam Boilers. Four boilers, the feed-water of which was heated by the exhaust steam from a Westinghouse engine, after being in use about six weeks, were so damaged that one boiler had to be completely removed; the other three had to receive extensive repairs. An examination of the boilers showed that the flues were covered with a deposit of fatty slime. An analysis of this showed that about 52 per cent. of it consisted of mineral oils and paraffine, and 27 per cent. of animal fat. It is strongly advised, therefore, that feed-water shall always be filtered so as to remove any oils or grease.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

MONDAY, JANUARY 21, 1895.

The Market for Gas Securities.

Consolidated is strong and higher, the opening to-day (Friday) having been made at 130 bid, holders asking 131. New York and East River common is weaker, at 30 to 31, and the market looks undeniably weak for it, although we know nothing that would cause us to change our opinion of a fortnight or so ago regarding it. We think it is cheap at the figures given, and believe that those behind it are competent to take care of it, unless that famous tunnel fills. Standard preferred is strong, and Equitable is in fair demand. The rate bills have made their appearance in the Assembly and Senate, and we imagine the one that will cause no little trouble is the proposition of Senator Coffey, of Kings county, who thinks $1 per 1,000 would be about right. The Brooklyn situation is unchanged. Chicago gas experienced another "down" this week, some seller 60 contracts having been made below 70. To-day the stock opened at 73¾ bid, and it is cheap. Baltimore gas is steady at 64½ to 65. Lacledes are also higher.

Gas Stocks.

Quotations by Close & Nash, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

JANUARY 21.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	130	131½
Central	500,000	50	115	—
" Scrip	220,000	—	100	—
Equitable	4,000,000	100	178	180½
" Bonds	1,000,000	—	107½	—
Metropolitan, Bonds	658,000	—	108	112
Mutual	3,500,000	100	153	157
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	95	—
" Bonds	150,000	—	95	—
N. Y. & East River Gas				
Common	5,000,000	100	30	31
Preferred	2,000,000		45	47
Bonds	3,500,000	100	84½	85½
Richmond Co., S. I.	348,650	50	50	—
" Bonds	100,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	41	43
Preferred	5,000,000	100	90	92
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	118	122
Citizens	1,200,000	20	60	65
" S. F. Bonds	320,000	1000	—	101
Equity Gas Light Co.	2,000,000	100	—	—
Bonds	1,000,000	—	—	—
Fulton Municipal	3,000,000	100	170	175
" Bonds	300,000		103	—
Peoples	1,000,000	10	85	—
" Bonds (7's)	368,000	—	100	—
(6's)	94,000	—	98	100
Metropolitan	870,000	100	165	—
" Bonds (5's)	70,000	—	—	155
Nassau	1,000,000	25	200	—
" Ctfs.	700,000	1000	99	100
Williamsburgh	1,000,000	50	190	200
" Bonds	1,000,000	—	107	110

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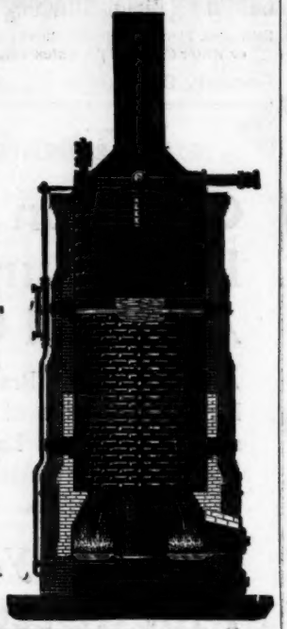

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20 S. Fifteenth Street,
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To COL. W. E. BARROWS, G. M., Welsbach Light Co., Gloucester, N. J.:

Dear Sir—Owing to the severe storm of Wednesday night, which did so much damage to telegraph, telephone and electric light property in the City, I considered it would be well to examine the Welsbach lights in Rittenhouse Square. I therefore sent a man to make a critical examination of the lights, after they had been lighted the following night. It gives me great pleasure to state that of the 48 lights in the Square, not one was out of order or required repairing, all of them being in perfect condition, and showing no sign of being affected by the storm.

Very truly yours,

R. J. ROLSTON, Superintendent.

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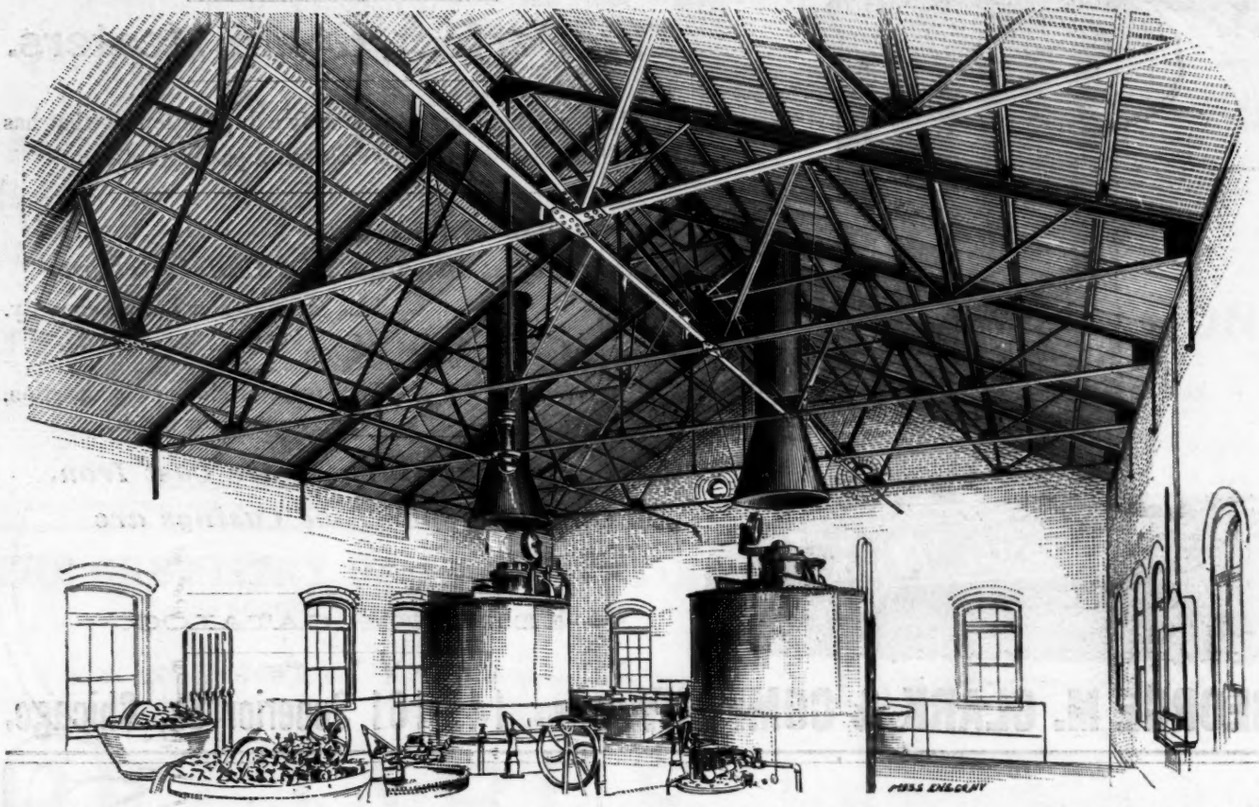

The above illustration is taken direct from a photograph, and shows the construction of an Iron Truss Roof designed and built by us for the Providence Gas Light Company, at Providence, R. I. The building is 40 ft. in width by 100 ft. in length, the side walls being of brick and the roof being entirely of iron—that is, iron trusses and iron purlins covered with corrugated iron. The building is ventilated by our Improved Ventilator, extending the full length of the roof, with side shutters opened and closed by cords from the floor. No woodwork is used in any way about the construction of the building.

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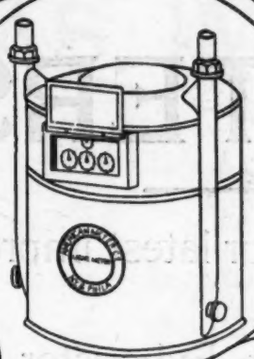
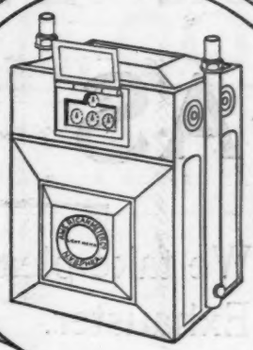
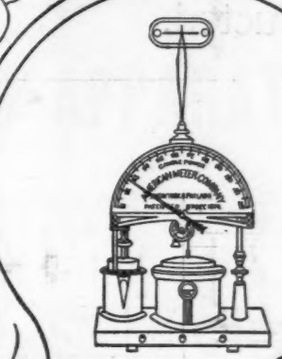


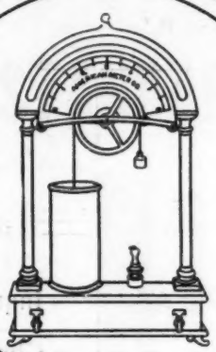


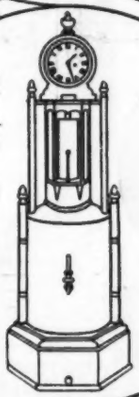
PUBLIC LIGHTING TABLE.

FEBRUARY, 1895.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M.
Fri.	1	11.10 PM	6.10 AM	5.05	6.15
Sat.	2	12.20 AM FQ	6.10	5.05	6.15
Sun.	3	1.30	6.00	5.05	6.15
Mon.	4	2.40	6.00	5.05	6.15
Tue.	5	3.50	6.00	5.10	6.10
Wed.	6	4.50	6.00	5.10	6.10
Thu.	7	5.30	6.00	5.10	6.10
Fri.	8	No L.	No L.	5.10	6.10
Sat.	9	No L. PM	No L.	5.10	6.10
Sun.	10	No L.	No L.	5.10	6.10
Mon.	11	6.00 PM	9.10 PM	5.10	6.10
Tue.	12	6.00	10.20	5.20	5.55
Wed	13	6.00	11.40	5.20	5.55
Thu.	14	6.00	12.50 AM	5.20	5.55
Fri.	15	6.00	2.00	5.20	5.55
Sat.	16	6.00 LQ	3.10	5.20	5.55
Sun.	17	6.10	4.10	5.20	5.55
Mon.	18	6.10	5.00	5.20	5.55
Tue.	19	6.10	5.40	5.30	5.55
Wed	20	6.10	5.40	5.30	5.55
Thu.	21	6.10	5.40	5.30	5.55
Fri.	22	6.10	5.40	5.30	5.55
Sat.	23	6.10	5.40	5.30	5.55
Sun.	24	6.20 NM	5.40	5.30	5.55
Mon.	25	6.20	5.40	5.30	5.55
Tue.	26	6.20	5.40	5.30	5.45
Wed.	27	6.20	5.40	5.30	5.45
Thu.	28	6.20	5.40	5.30	5.45

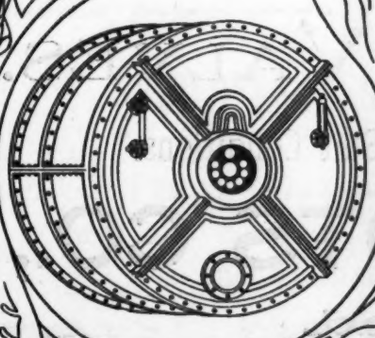


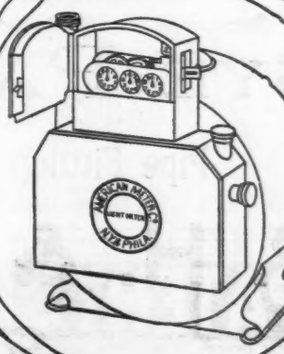




TOTAL HOURS LIGHTING DURING 1895.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	237.00	January	423.20
February	196.40	February	355.25
March	195.50	March	355.35
April	165.30	April	298.50
May	153.40	May	264.50
June	138.20	June	234.25
July	146 30	July	243.45
August	152.50	August	280.25
September	165.10	September	321.15
October	186.10	October	374.30
November	204.10	November	401.40
December	219.30	December	433.45
Total, yr.	2161.20	Total, yr.	3987.45





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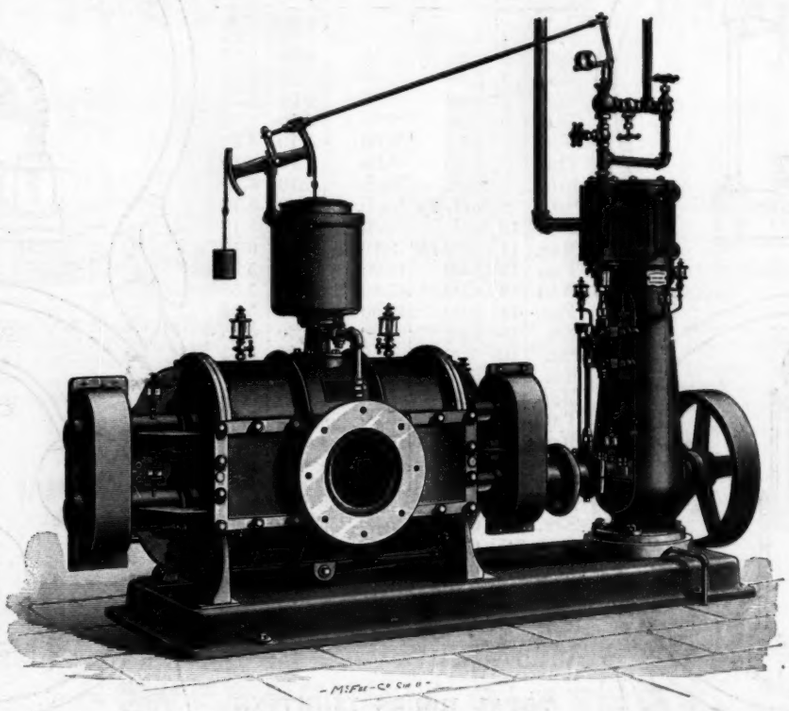

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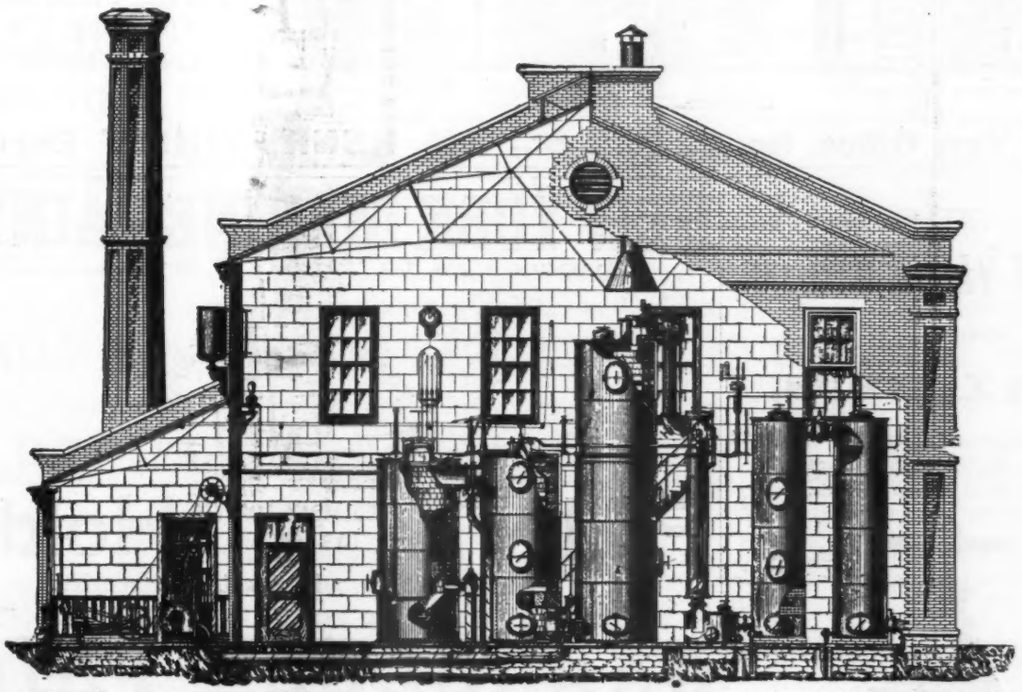

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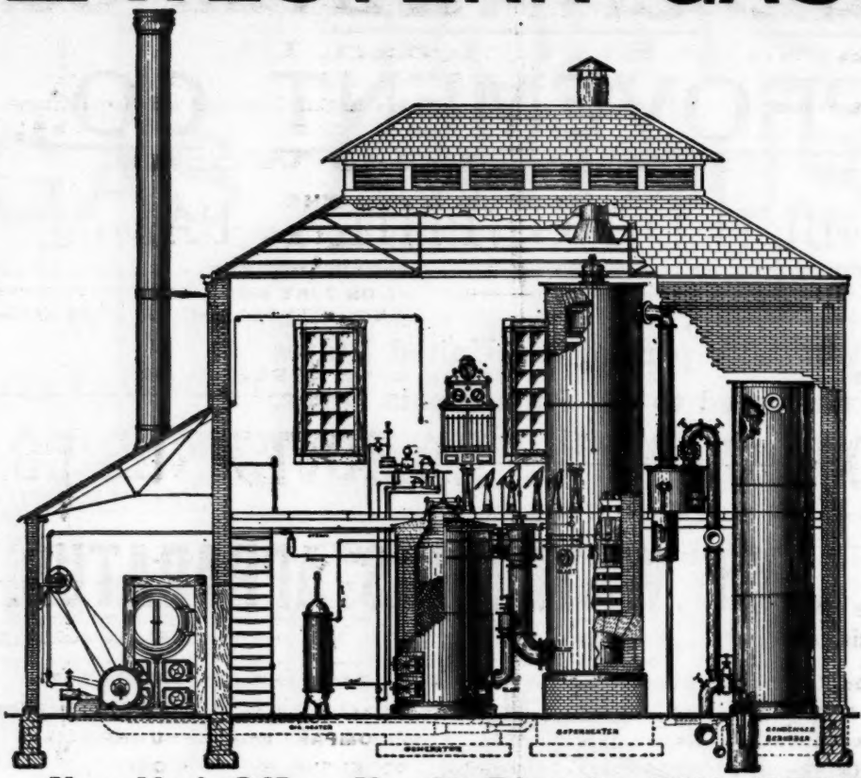

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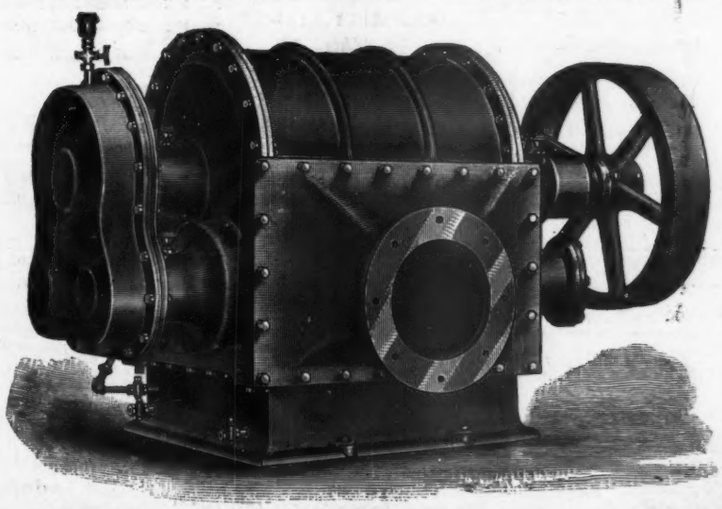

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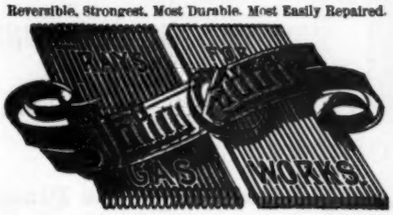

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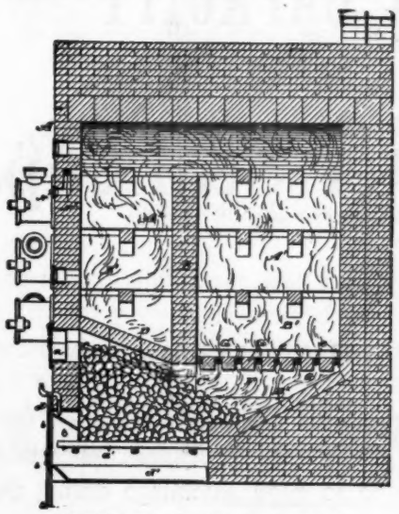

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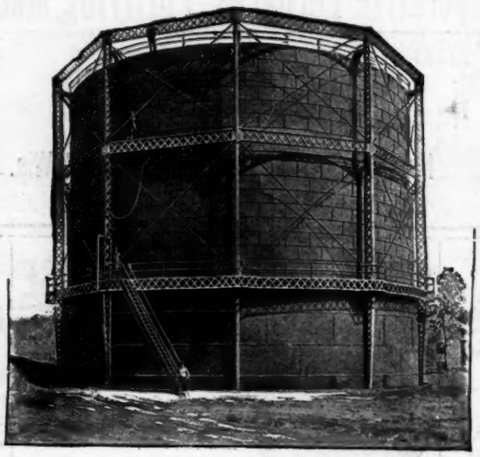

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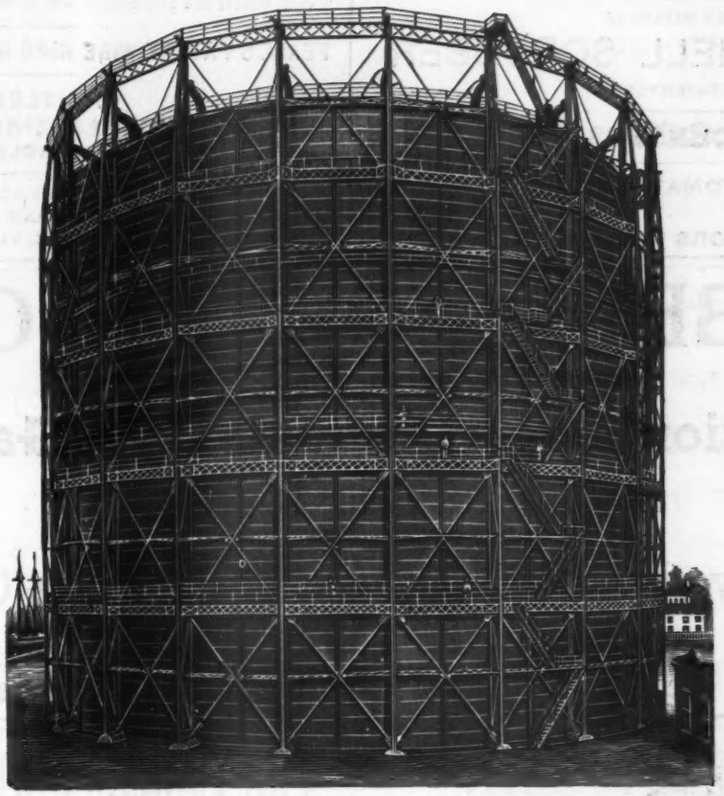

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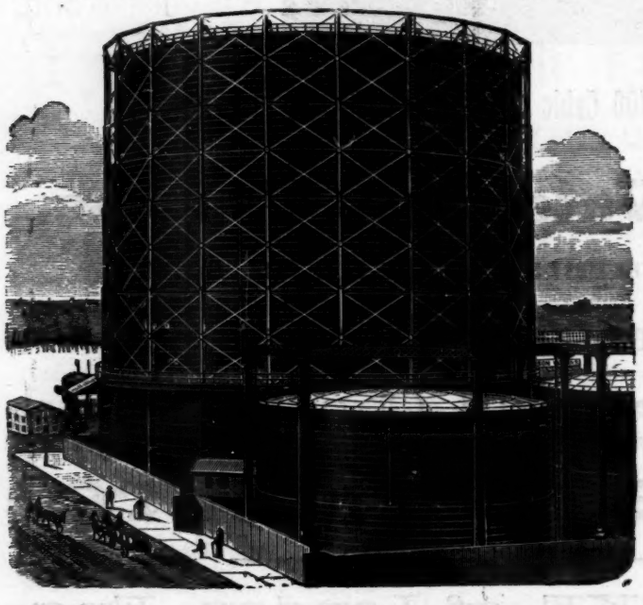

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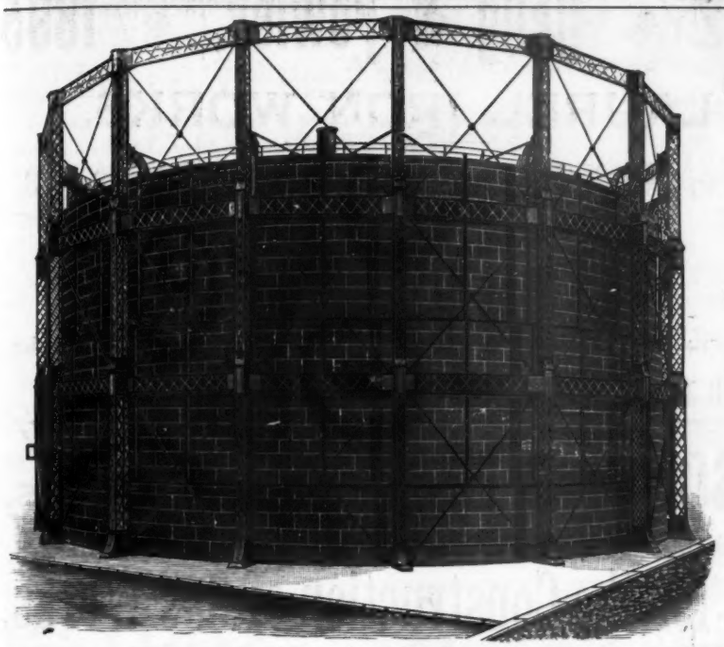

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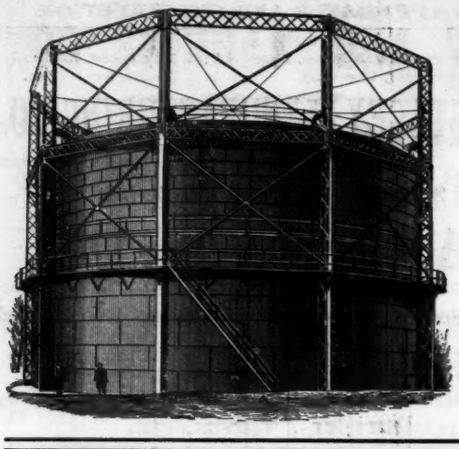

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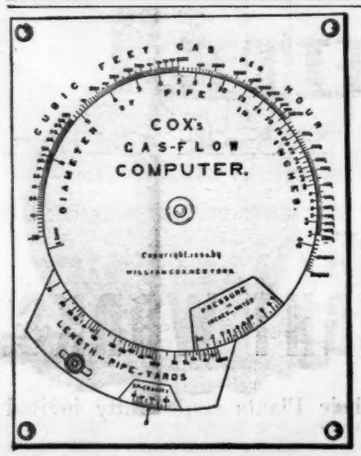

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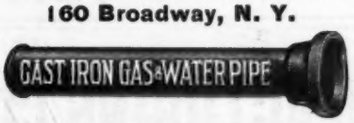

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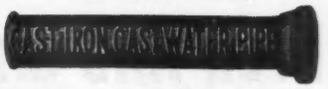

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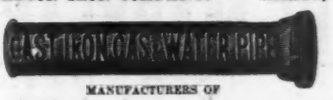

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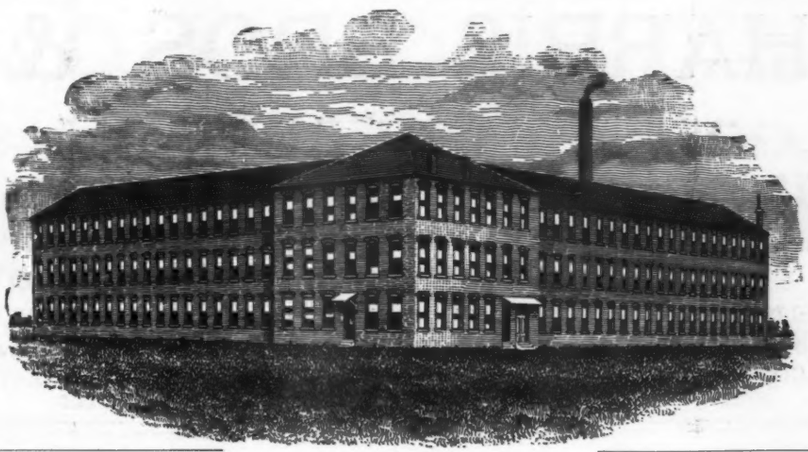

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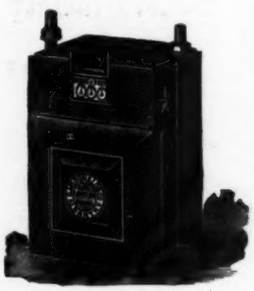

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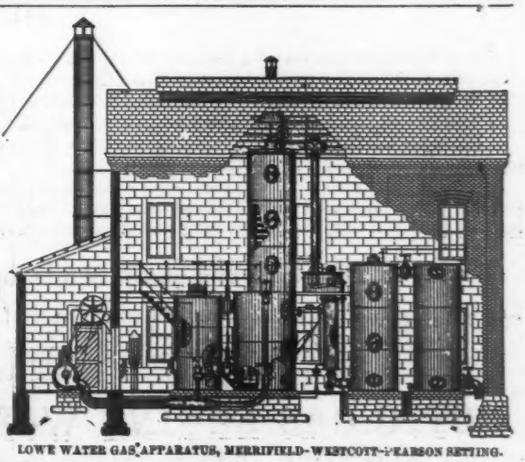

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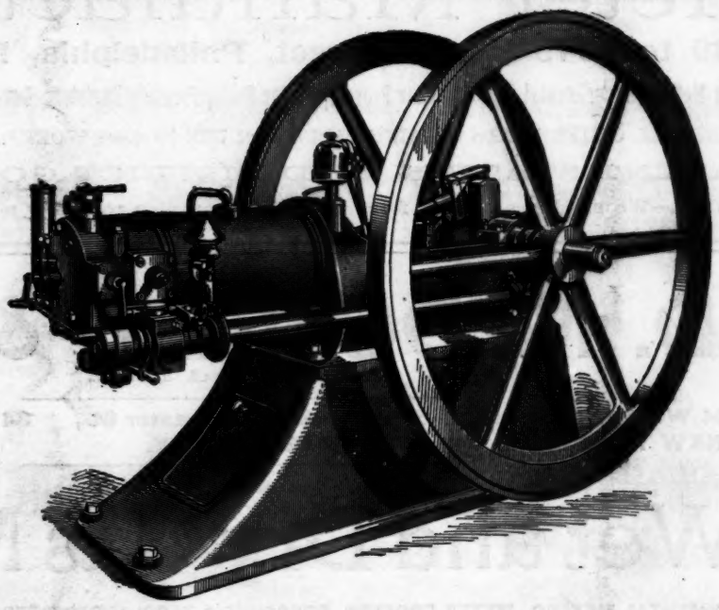

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